FLIGHT

Salute to the R.A.F

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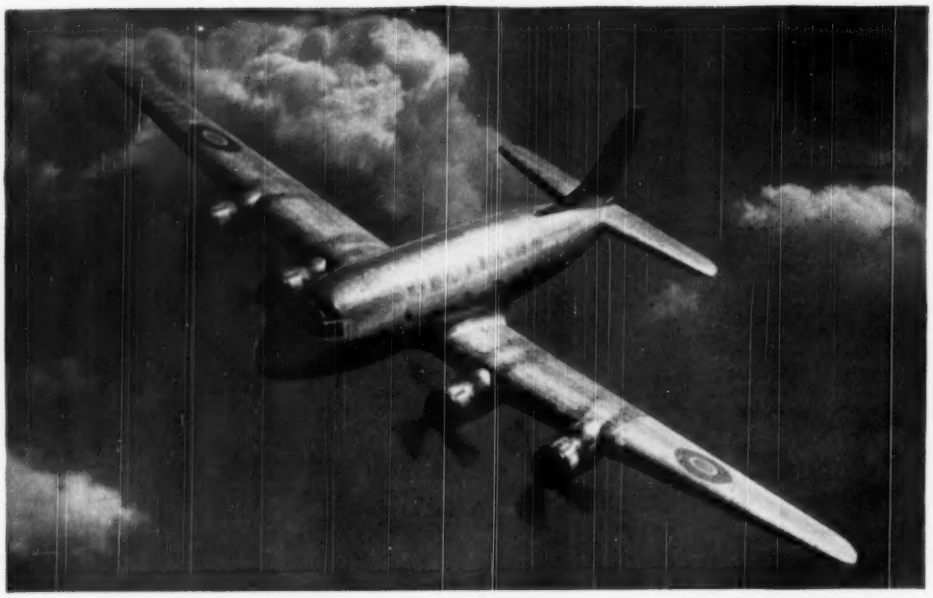

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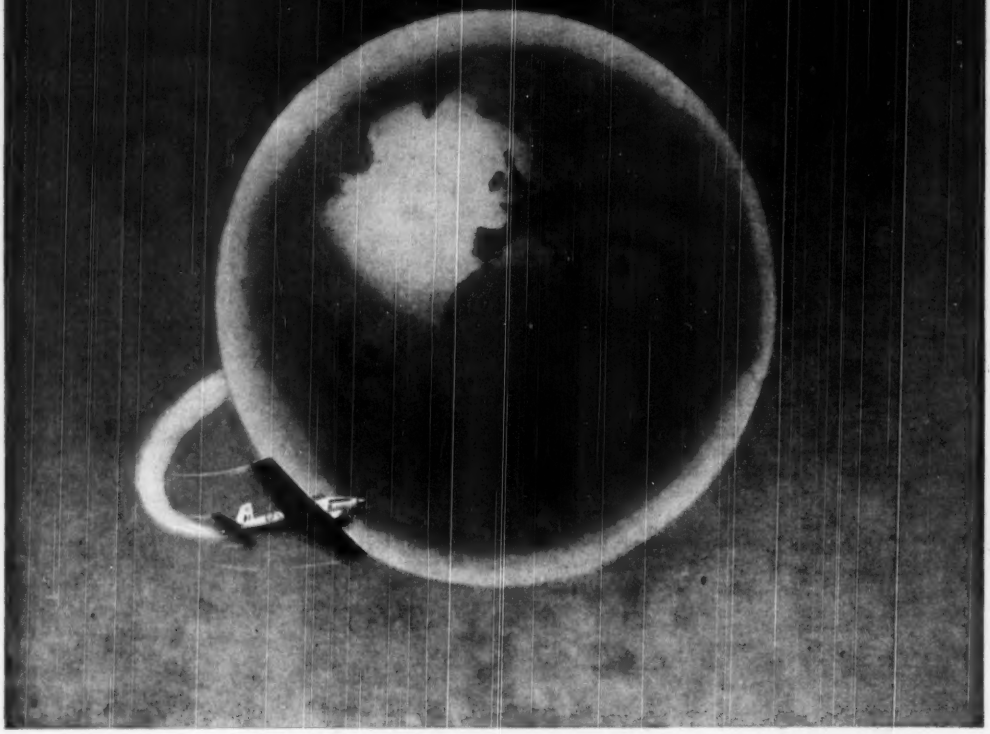

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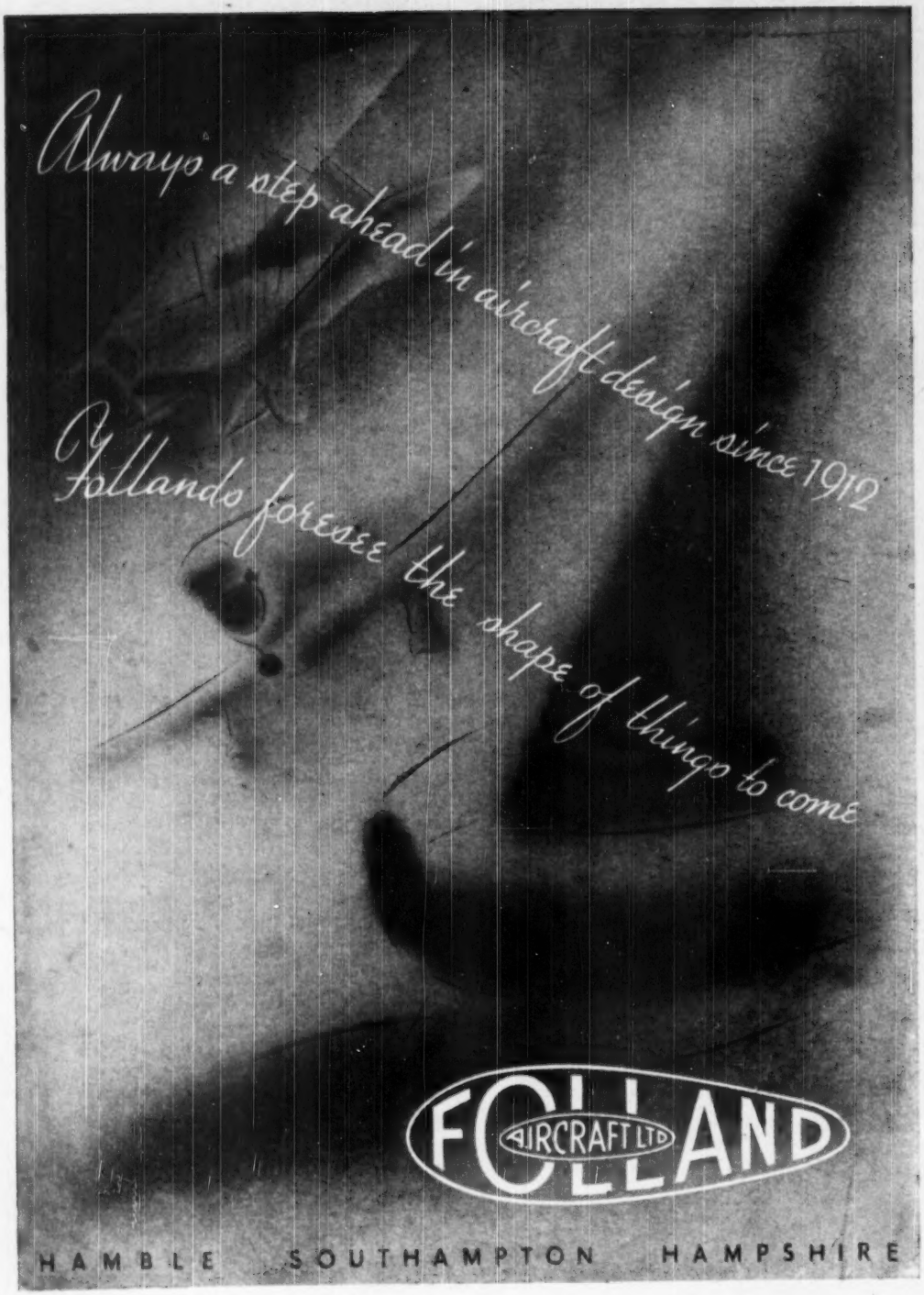
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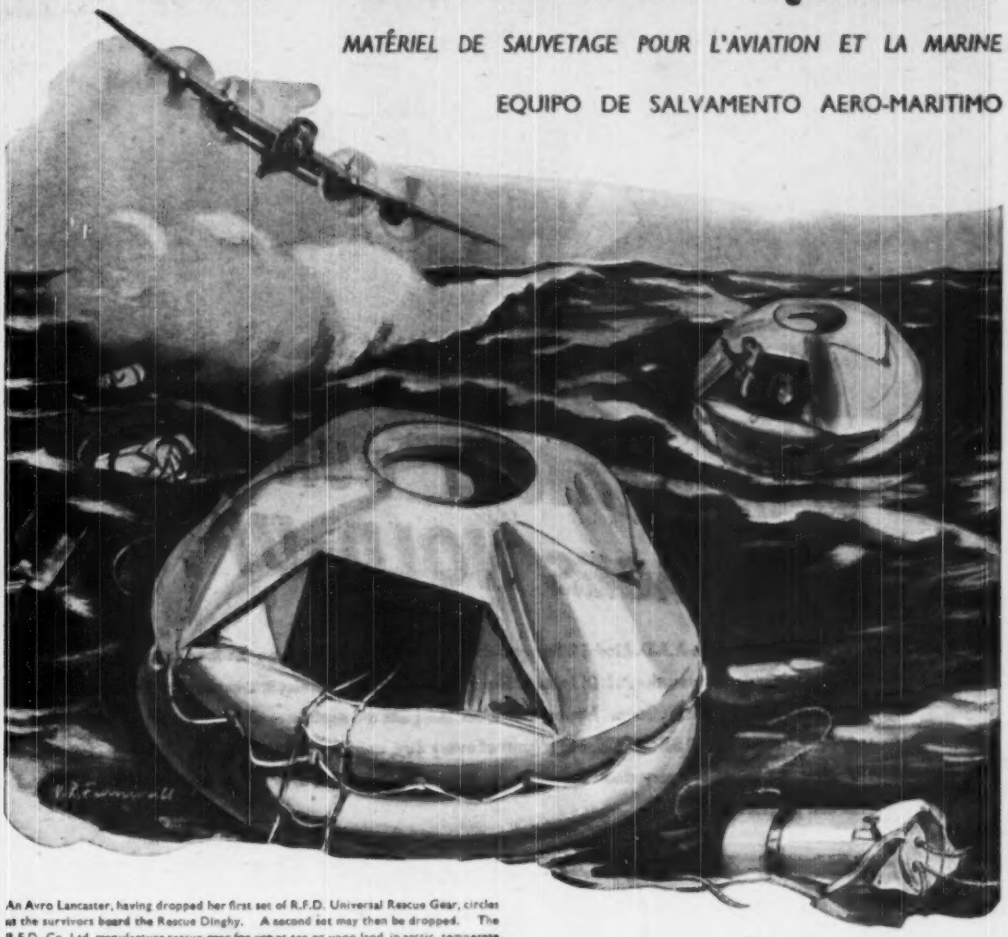
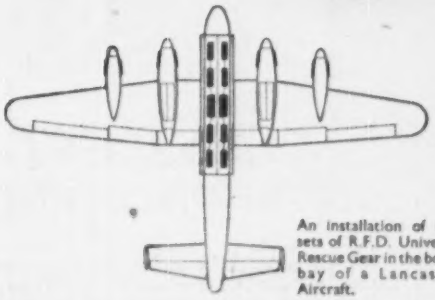


An Avro Lancaster, having dropped her first set of R.F.D. Universal Rescue Gear, circles as the survivors board the Rescue Dinghy. A second set may then be dropped. The R.F.D. Co. Ltd. manufacture rescue gear for use at sea or upon land, in arctic, temperate or tropical zones, which can be modified for installation in all types of aircraft.

Un Avro Lancaster, ayant lancé son premier jeu de Matériel de Sauvetage Universal R.F.D., décrit des cercles au-dessus pendant que les survivants montent dans le petit canot de sauvetage. L'avion peut alors lancer un second jeu de matériel. La R.F.D. Co. Ltd. fabrique un matériel de sauvetage pouvant s'employer en mer ou sur terre, dans les régions arctiques, tempérées ou tropicales, et susceptible de se modifier en vue de son installation sur avions de tous types.

Después de haber lanzado su primer Equipo R.F.D. de Salvamento Universal, un Avro Lancaster va circulando mientras los sobrevivientes abordan el Bote Neumático Salvavidas. Entonces se puede lanzar un segundo equipo. La R.F.D. Co. Ltd., fabrica equipos de salvamento para su empleo en el mar o bien por tierra en las regiones árticas, templadas o tropicales, equipos que pueden modificarse para ser instalados a bordo de todos tipos de aviones.



An installation of two sets of R.F.D. Universal Rescue Gear in the bomb bay of a Lancaster Aircraft.

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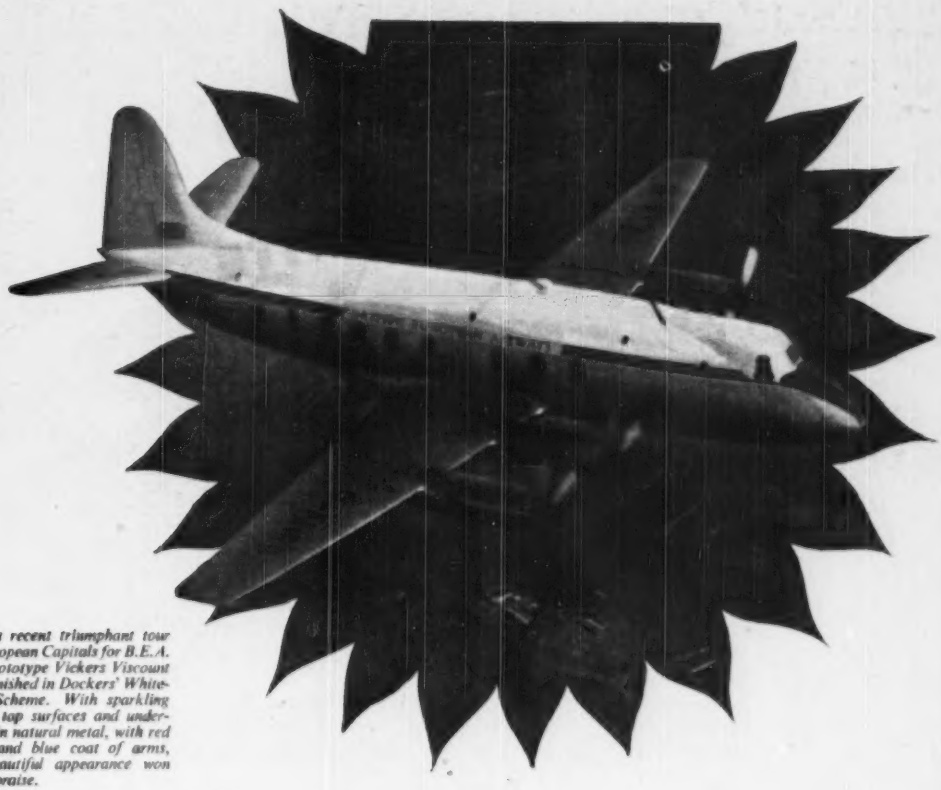

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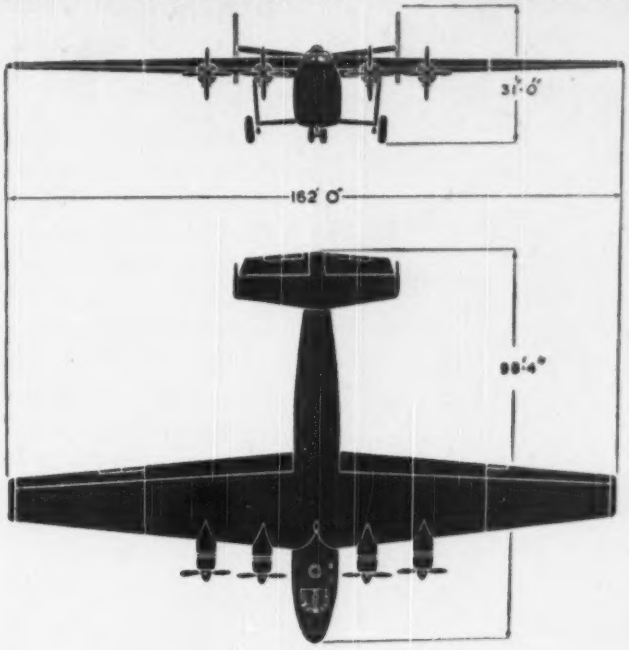

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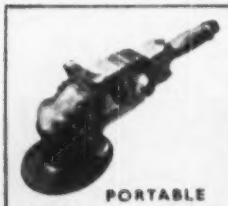

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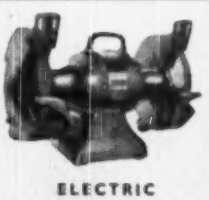

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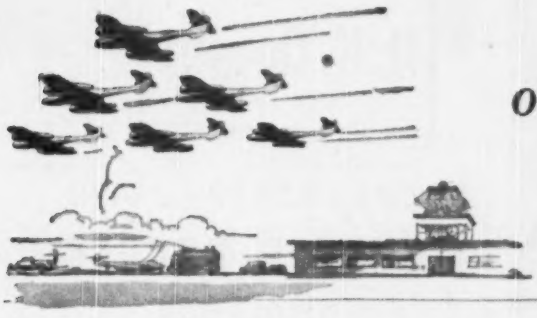

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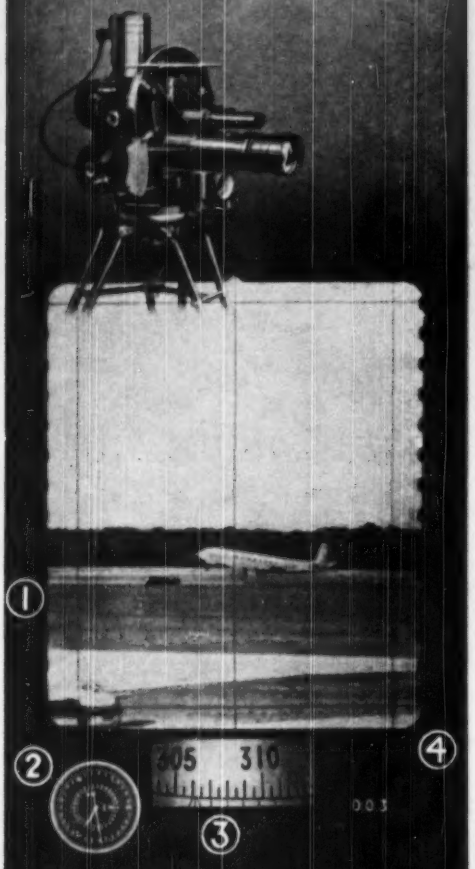

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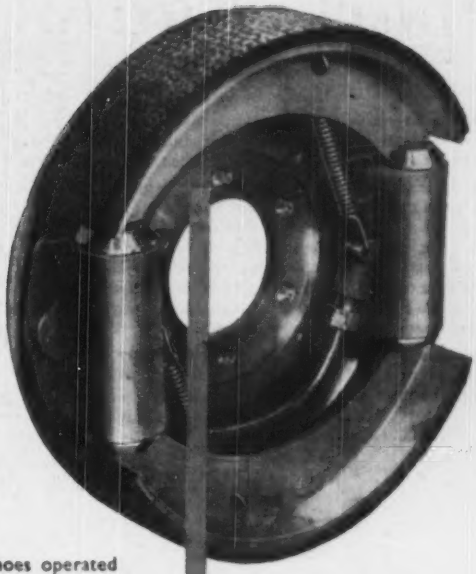

THIS brake consists of two self-aligning shoes operated by two wheel cylinders spaced diametrically opposite. Each wheel cylinder has two pistons of a different form: one having a slot at right angles to the axis of the bore, which operates the shoe when the brake is used in forward rotation and the other with the slot inclined at an angle to the bore which forms the abutment for the other shoe in similar condition. This inclined slot has a predetermined angle which allows the shoe to align itself accurately to the drum as well as forming the abutment. The total shoe reaction is transmitted via a shoulder on the piston to the cylinder body. By this arrangement, two-leading shoe operation is obtained in either direction, and greater power for a given input and greater stability is obtained.

TYPICAL FIGURES

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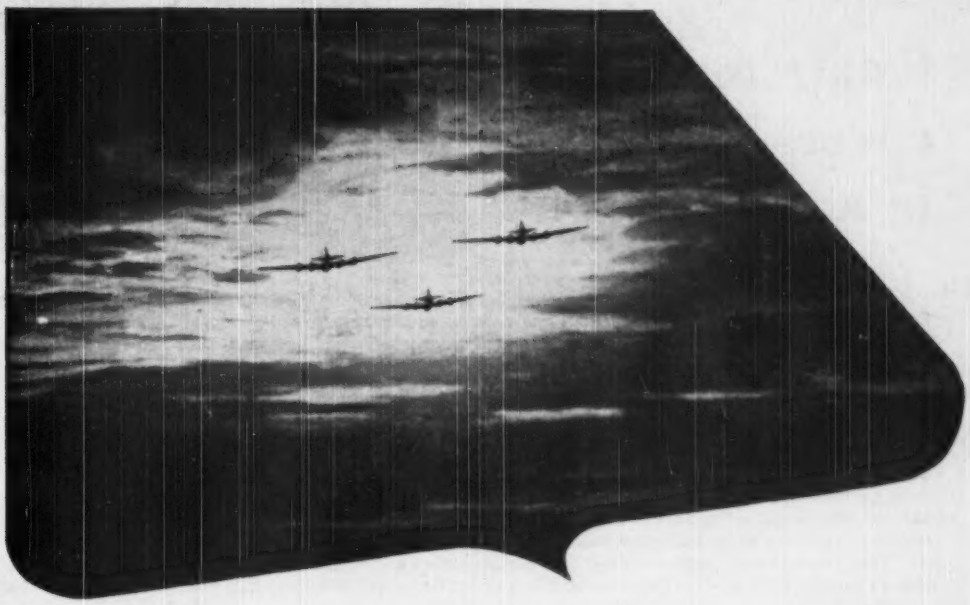

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"But that's all over now. Since the company brought a Sealand out here, and based it on the capital (where we do the office work), I've got around quite a bit. Yes, I should think I cover about a 1,000 miles on some days.

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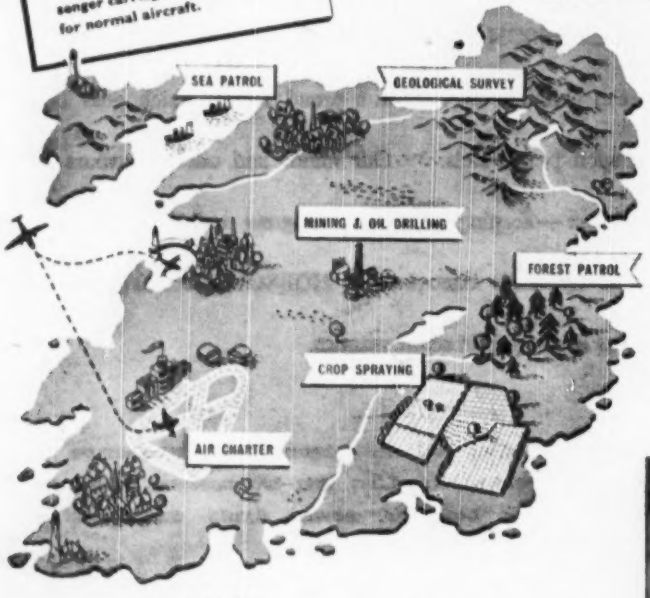

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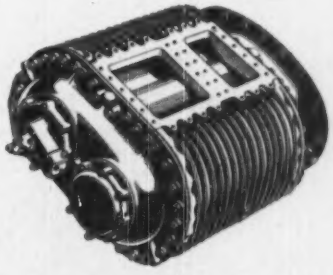

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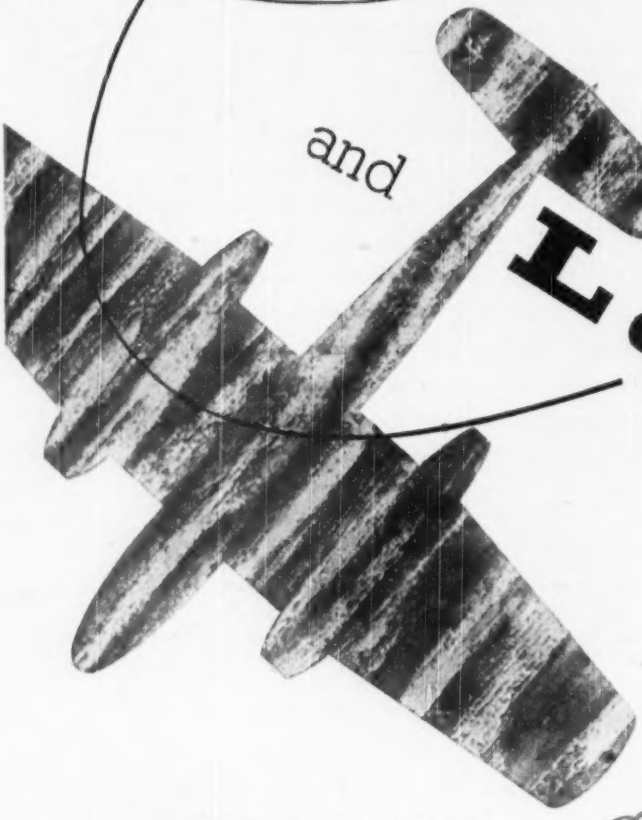

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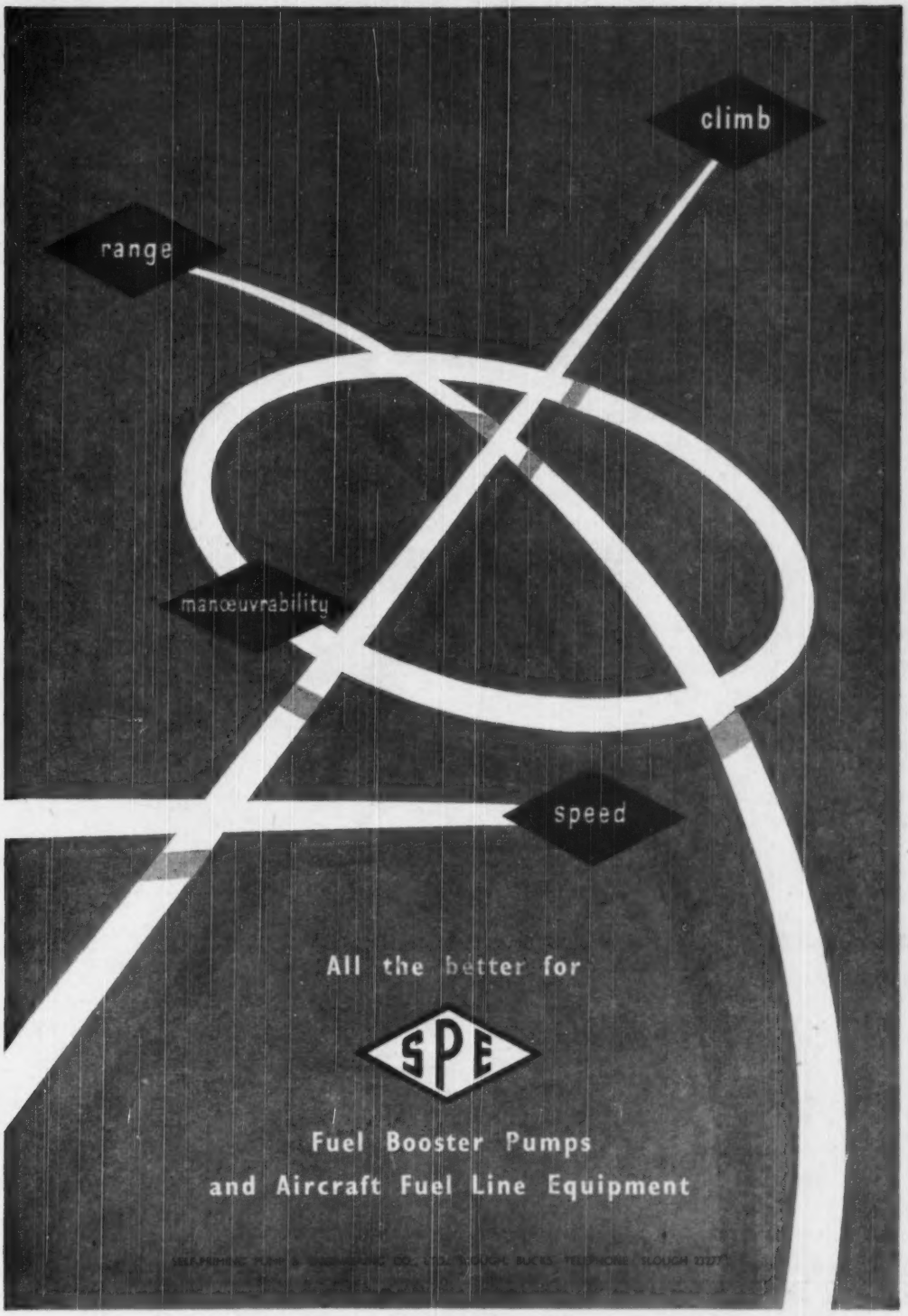
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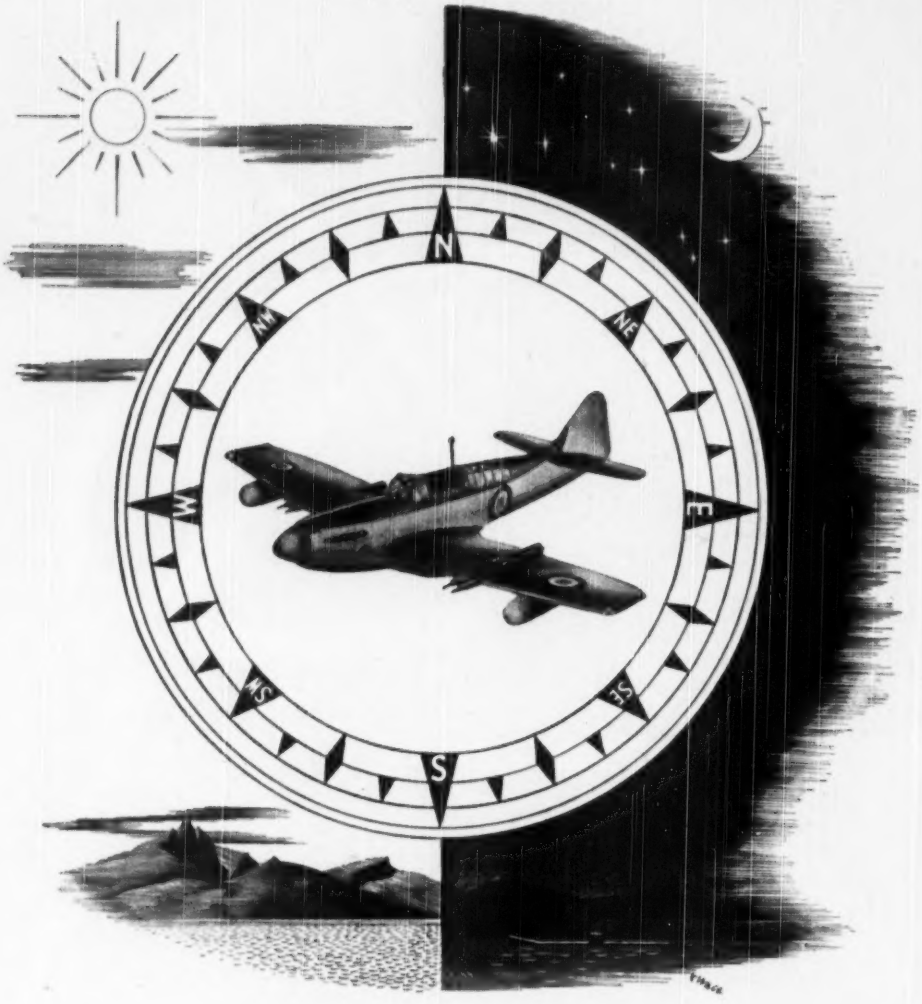

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Air Power on Parade

THIS week-end we are to be treated to the greatest peacetime spectacle of military aviation ever staged in this country and, possibly, in the world. There is little doubt, moreover, that this R.A.F. Display will prove to be a worthy successor to the many glorious Hendon Pageants of pre-war years. The truly amazing performance of modern military aircraft would have been inconceivable to those who planned the first displays in the piston-engine years of the 'twenties and 'thirties. But though they provide additional excitement in a programme which promises to be packed with it, jet fighters and bombers set new problems in stagecraft with their five-mile turning circles and zooms to 15,000ft and more.

Few will witness this first post-war R.A.F. Display without wondering what conclusions may be drawn regarding the country's air strength and preparedness. To some it may bring a feeling of security, for certainly several outstanding types of aircraft—to which reference is made elsewhere in this issue—will be seen, and the numbers of modern aircraft flying in the formations will be greater than on any occasion since the war. There is no justification for complacency, however. Problems of manning and reorganizing which had to be faced after the war have been tackled resolutely, and recently with very encouraging results. Britain still possesses an Air Force magnificent in tradition and outstanding in efficiency, though it remains relatively small in numbers of men and machines, and these are as yet inadequately supported by ground and airborne radar.

Inevitably one again takes stock of the situation in the new light of Communist aggression in Korea—undeniably a threat to world peace. A halt must be called to such actions now if other small republics and nations are to be spared from similar attacks. Determination on this point, and the power to enforce it, will alone hold back the aggressor, and we welcome the strong line taken by the United States and the support to which this and other countries are pledged.

The South Korean president feared that the aid offered would be "too little and too late." Many people in this country also feel with justification that Britain's air strength is too little and plans for increasing its size and striking power may mature too late.

To officials in Washington and London, and to the Southern Republic itself, the Korean attack came as a complete surprise. An attack on this country would almost certainly be as unexpected and come with equal suddenness. It is therefore all the more important to speed up all deterrent preparations—the Royal Air Force tops the list under this heading—and do all in our power to make them adequate.

A powerful Bomber Command to retaliate and attack any enemy at his own bases, and a powerful Fighter Command to defend the Homeland and gain control of the air, are essentials if this country is to be free from the danger of attack.

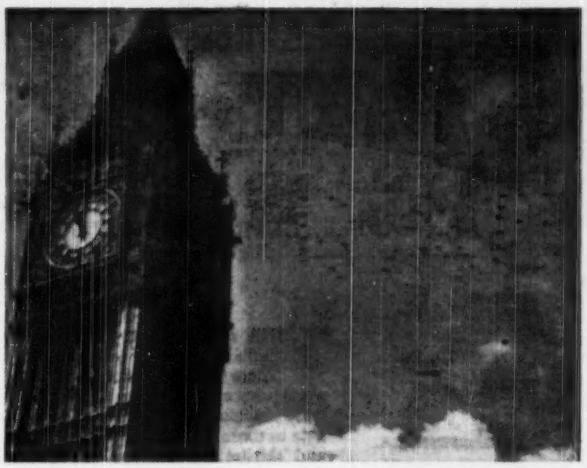
This Week's Issue of Flight

IN pre-war years it was *Flight's* custom periodically to review the work of the Royal Air Force. Additionally, the annual Hendon Pageants provided ideal opportunities for the presentation of descriptions of the aircraft currently in service. To mark the occasion of the first revival of the R.A.F. Display since 1937, this issue of *Flight*, much enlarged, contains descriptions of the organization, reviews of the equipment and especially of the work of the Commands of the R.A.F. The Editor wishes to express his sincere thanks to all those who have so readily assisted in the preparation of the Command features—the Air Officers Commanding-in-Chief for their messages, the serving officers on their staffs, and the members of the Air Ministry Information Division. Their willing co-operation has made possible the preparation of what we trust will prove a valuable work of reference.

Regular readers of *Flight* will recognize that we have not been able to cover some of the many activities of the R.A.F. as comprehensively as we had planned and promised. Any failure on our part to do full justice to a great national occasion and a great fighting Service, is attributable to the effects of the ban on overtime working by a section of the printing industry, to which reference has been made in previous issues.

THE DISPLAY in PROSPECT

A Lengthy Programme of Choice Events : Spectacle and Instruction Happily Combined



Thirty-seven Harvards heralded the great occasion with this formation flight over the capital on July 1st. They are seen above Westminster.

THE spectacle of Harvards from the Central Flying School forming the letters R.A.F. in the sky over London last week-end was probably the most effective contribution yet made towards publicizing the R.A.F. Display. At very short notice, the C.F.S. has also undertaken to form the Royal cipher (G.R.VI), again with Harvards, during the Display, in place of a cancelled event. G/C. Stephenson, commandant of the C.F.S. and an A.D.C. to the King, will lead both the formations.

A preliminary survey of the programme for July 7th and 8th, and of the practice and preparations under way at Farnborough, left us with no misgivings as to the success of the Display.

Last week-end a number of events in the flying programme were rehearsed at Farnborough. After the C.F.S. fly-past on Saturday morning, 12 Vampires practised their attack on a strong-point and, later in the day, 12 Meteors were scrambled for "defence of an airfield" against Mosquitos and Hornets. Mosquitos also took part in a dummy-run over the Amiens-prison set-piece. During Sunday's rehearsals, Auxiliary air drill took the place of the Meteor's dramatic interception.

Left: Group Captain W. A. L. Satchell, D.S.O., Officer Commanding R.A.F. Display Unit, with his personal assistant, F/L. W. Young, D.F.C. Right: Split-second timing — S/L. Lang (in beret) and his pilots of No. 66 Squadron check watches with the standard display chronometer.

"Flight" photograph.

On both days of the Display, the programme begins at 10.30 a.m. The mornings will be devoted mainly to ground events —massed-band displays, P.T. exhibitions, drill and demonstration by police dogs—but there will also be aerobatics by Balliols and Chipmunks, and an exhibition of A.T.C. glider training. To-morrow (Friday) the Cooper Trophy Race between R.Aux.A.F. fighters will take place at 12.45 p.m.; at the same time on Saturday there will be air drill by Royal Auxiliary Air Force squadrons.

The main flying programme, which begins at 2.30 p.m., is particularly well balanced. After individual aerobatics by a Vampire, the first event, a number of veteran aircraft will be displayed (the majority will not be flown, however). They include an Avro 504K, Sopwith Camel, S.E.5A, Fokker D.7 and a 1911 Gordon Bennett Cup Bleriot. Meteor aerobatics—the next item—will complete the contrast. Aerobatic demonstrations will also be given by Vampire and Meteor formations, the Canberra, Venom, Supermarine 510, Hawker P.1081, Spitfire 16 and an Olympia sailplane. On the lighter side, the helicopter circus and pupil-and-instructor events should provide hilarious entertainment.

The "attack on Amiens prison," ground-strafing by Vampires, and interception by Meteors together promise to be highlights of the Display. Although the preliminary rehearsals were completed without large-scale use of explosives, the effect was still highly dramatic. The Display will be concluded by the fly-past, which is divided into two sections. In the first (slower) part will be Sunderlands, Dakotas, Hastings, Lincolns and U.S.A.F. B-29s. An R.A.F. Washington (the new official name for British B-29s) will be on view, incidentally, in the static exhibition —part of the Display which every visitor should attempt to inspect. The final air parade will consist of Spitfires, Hornets, Vampires and Meteors, representing both R.A.F. and R.Aux.A.F. squadrons.

Over 400 aircraft will take part in the Display; 70 of them will be actually based at Farnborough, and many will fly from neighbouring airfields such as Odiham and Tangmere.

The commentator will be S/L. T. F. Neil, D.F.C., of Fighter Command, who has played a leading part in the planning of the flying programme. Rediffusion installations are abundant.

The next two days will be a culmination of several months' intense activity, not only on the squadrons, but at Farnborough itself, where the R.A.F. Display Unit—now some 350 strong—has been at work for six months. Granted fine weather, the Display should certainly justify all the effort behind it, and prove to be the finest military air pageant ever held—certainly in this country.

The R.A.C. has erected hundreds of its familiar blue and white signs to indicate a continuous route from the North of London all the way to Farnborough. The problem of traffic control has been aggravated by two other events in the area: London motorists are therefore asked to follow the indicated routes on both outward and homeward journeys.

NORTHERN HEIGHTS MODEL MEETING

SINCE its inception in the early 'thirties, the Annual Gala organized by the Northern Heights Model Flying Club has probably become the most popular event in the diaries of model aircraft enthusiasts.

The directors of Hawker Aircraft, Ltd., again made available Langley airfield as the venue for this year's highly successful meeting held on Sunday, July 2nd.

On behalf of all those who took part in and witnessed the contests, Dr. A. P. Thurston, the president of the Northern Heights Model Flying Club, sent a telegram to the Queen:

> The trustees of the Queen's Cup, the Gala Committee, the officers and members of the Northern Heights Model Flying Club, the directors of Hawker Aircraft, Ltd., the commandant, officers and apprentices of Halton, Royal Air Force, the representatives of the Commonwealth of Australia, the Dominion of Canada, the Union of South Africa, the United States of America, the competitors, model flyers, their families and their friends, now gathered together for the Queen's Cup competition at Langley airfield, the Mecca of model flyers, send loyal and affectionate greetings and grateful thanks. PETER THURSTON.

Her Majesty's reply to Dr. Thurston was as follows: The Queen has received with very great pleasure the message of loyal and affectionate greetings which you have conveyed on behalf of all those present at Langley airfield to-day. Her Majesty commands me to thank you all most warmly and to wish you all a most successful Gala Day.

MAJOR THOMAS HARVEY, D.S.O.,
Private Secretary.

Approximately 20,000 enthusiasts—for enthusiasts they all were—took part in a thoroughly enjoyable day's flying at Langley. A conservative estimate has placed the number of model aircraft flown during the day at something like 3,000. To an eye-witness most of them appeared to be either in the air or diving earthwards at the same moment. In fact, it was a brave man who progressed more than a few yards without displaying signs of the proverbial fighter-pilot's "twitch."

In a speech made during the prize-giving ceremony, Sir Richard Fairey paid tribute to the exceptionally high standard of design and construction. Lady Fairey presented the coveted Queen's Cup for the duration contest for rubber-powered aircraft to Mr. J. A. Howard of the Kentish Nomads Model Flying Club. Other prizes were handed to their deserving recipients by Lady Violet Bonham-Carter.

CIERVA PILOT APPOINTED

IT is announced by the Cierva Autogiro Co., Ltd., that, as from June 30th, Mr. G. A. Ford has taken up the appointment and duties of chief pilot to the company.

Mr. Ford joined the Cierva Company in February this year.

DIRECT TRANSATLANTIC SERVICES

THE recent announcement that B.O.A.C. plans to introduce a weekly non-stop London to New York and return service with their Stratocruisers is very welcome, for we are of the firm opinion that a direct North Atlantic service is required. Many travellers find the landings in the early hours of the morning in Ireland and Newfoundland very tiresome; there are obvious time-saving and operational advantages in addition.

On further examination, however, the initial statement, if accepted as it stands, is somewhat misleading and needs further qualification. While the carriage of a full complement of 60 passengers over the 3,400-mile stage non-stop is a comparatively easy matter on the eastbound flight, a direct journey in the opposite direction, with its strong prevailing headwinds, could not be accomplished with any appreciable regularity unless the Stratocruisers exceeded their present maximum a.u.w.

The true interpretation of B.O.A.C.'s statement is that the services are only scheduled to be flown non-stop in the eastward direction; from London to New York at least one stop is planned at either Shannon or Gander. Passengers may leave at 0900 G.M.T. and arrive in New York at 0255 G.M.T. The return flight departs from New York at 2100 G.M.T. and reaches London at 1000 G.M.T. the following morning.

While an a.u.w. increase is known to be under consideration by the C.A.A., a recent announcement in this country that it had already been granted is understood to be incorrect. It is interesting to note, however, that, as reported on page 4, the C-97A Stratofreighter (the military version of the Boeing 377) was recently flown at a gross weight of 174,500 lb.

PRESENTATION DAY AT CRANFIELD

IN the company of a large number of most distinguished guests, the third annual presentation of diplomas and prizes took place at the College of Aeronautics, Cranfield, on Friday, June 30th. The presentations were made by Mr. W. T. Gill. The Governors' Prize was won by Mr. G. S. Henson, as the best all-round student of the two-year course, and the Principal's Prize for the best piece of original work by a second-year student was awarded to Mr. Robert Westley for his work on the problem of curvilinear supersonic motion. In this connection, Mr. Ernest F. Relf, the Principal of the College, said he thought that Mr. Westley had laid the foundation of a great deal of work which must inevitably follow. Other awards were:—

Diploma with distinction.—J. E. Daboo, K. D. Harris, W. J. Rainbird, R. Westley (Aerodynamics); S. Butler, C. R. Fletcher, J. W. Fozard, J. E. Hart, G. S. Henson, H. S. Liner, J. R. Lloyd, K. A. Rowland (Aircraft Design); S. Gray, F/L. J. T. Morris (R.A.F.), G. R. Nicolson (Aircraft Propulsion). **Diploma.**—C. F. Bee, G. W. Bleasdale, A. L. Buchan, B. Caiger, E. C. Carter, T. N. Corkill, F/L. D. Duncan (R.A.F.), A. H. Eldridge, M. D. Hodges, C. G. Hughes, E. T. B. Smith, P. M. Somervail, F. E. Watts (Aerodynamics); J. Berry, H. Chetwood, K. E. Cheverton, C. Faulkner, Lt. D. M. Hardy (R.N.), R. D. M. Harper, E. E. Labram, A. McKay, Lt. R. K. Midgley (R.N.), Lt. J. A. I. Reid (R.N.), K. O. Scott, N. H. Stewart, Lt. D. G. Titford (R.N.), S. Wood (Aircraft Design); W. E. Digweed, R. G. Richards (Aircraft Economics and Production); E. S. Elmolla, J. Finnegan, A. L. R. Fletcher, F. D. Henderson, C. J. J. Jessop, Lt. D. C. McGlashan (R.N.), L. J. Stephenson (Aircraft Propulsion). **Certificate for one-year advanced course.**—E. S. Farris (Aircraft Propulsion and Aerodynamics); E. E. Watts (Aircraft Economics and Production). **Certificate for one-year course.**—F/O. D. J. Cockrell (R.A.F.), F/L. J. N. Quick (R.A.F.).

NEW S.B.A.C. PRESIDENT

NEWLY elected President of the Society of British Aircraft Constructors for the year 1950-51 is Mr. W. T. Gill, C.A., financial director of Rolls-Royce, Ltd. He will succeed Sir Roy Dobson, the managing director of A. V. Roe, Ltd.

Mr. W. T. Gill joined the Rolls-Royce company in 1939 as accountant at their Glasgow factory, and in 1942 was appointed chief accountant of the whole group of factories (Derby, Glasgow, Crewe and Barnoldswick). His appointment as commercial manager came in 1945, and as commercial and financial director in 1946. Since that time he has been a member of the council of the S.B.A.C. and its Management Committee. Rotol, Ltd., and Renfrew Foundries, Ltd., are among other companies of which Mr. Gill is a director.

Mr. W. T. Gill, C.A.

DE HAVILLAND CHAIRMAN RETIRES

THE retirement of Mr. Alan S. Butler from the chairmanship of the de Havilland Aircraft Co., Ltd., and from his directorships of the parent company and associated companies, was announced on June 29th. Mr. Butler had been a director of the de Havilland Co. since 1921, and chairman since 1924. Mr. F. T. Hearle has been appointed chairman, and Mr. W. E. Nixon deputy chairman of the company.

HERE and THERE

Vampires for 614 Squadron

THE next squadron of the R.Aux.A.F. to receive Vampires in place of its Spitfires will be No. 614 (County of Glamorgan), based at Llandow. As a preliminary step, two Meteor 7s are being delivered to the Squadron for jet conversion and instrument training.

No Hurry

THE Hawker P.1081 jet fighter, which was demonstrated at Antwerp-Deurne on June 25th, returned the following day to London Airport from Melsbroek, Brussels, in a take-off-to-touch-down time of 25 minutes. Although the pilot, Trevor Wade, made no attempt to set up a record, the point-to-point time (21-22 min) represents an average speed of some 600 m.p.h.

Air Horse Inquest

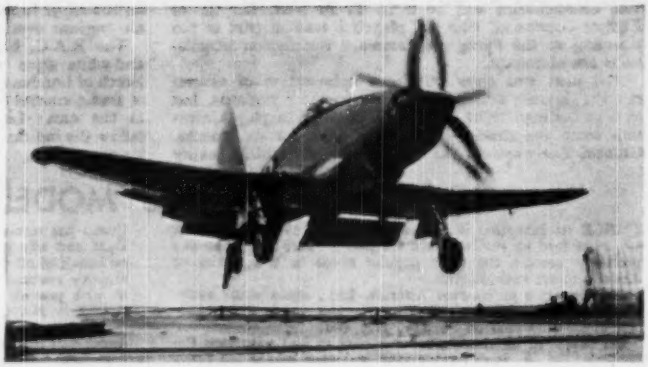
VERDICTS of death by misadventure were recorded at the inquest, on June 29th, at Eastleigh, on S/L. H. A. Marsh, S/L. F. J. Cable, and Mr. W. J. Unsworth, who were killed when the first prototype Cierva Air Horse crashed on June 13th. It was stated that the crash now appeared to have been caused by fatigue fracture of the "carrier driving link to the front rotor."

Journey's End

ON Wednesday of last week Capt. A. Bradshaw completed the last leg of his flight, in a Percival Proctor, from England to New Zealand by flying 1,400 miles across the South Tasman Sea from Hobart to Invercargill. In view of the danger of the journey he had been forbidden by the New Zealand Government to take his wife and child. Opinions may vary as to the prudence of making such flights, but Capt. Bradshaw is to be congratulated on his courage and perseverance. The crossing certainly demonstrates his confidence in the Proctor and its single D.H. Gipsy Queen engine.

Attacker and Valetta Return

AFTER flying 6,000 miles on their Near- and Middle-East demonstration tour, the Vickers Valetta and Vickers-Supermarine Attacker returned to Chilbolton, the starting-point, on June 23rd. Serviceability of both the transport and jet fighter proved excellent. There were no untoward incidents, and the aircraft were successfully demonstrated in French North Africa, Egypt, Lebanon, Syria, Iraq, Iran, Turkey, Greece and Italy. Mr. J. K. Quill was in overall charge of the tour; W/C. A. D. McN. Boyd flew the Valetta, and Lt.-Cdr "Mike" Lithgow was the Attacker pilot. Shell Aviation Services gave assistance all along the route.



ILLUSTRIOUS OCCASION: The West'and Wyvern T.F.2 Naval strike-fighter recently completed its initial deck-landing trials on H.M.S. *Illustrious*. With its 3,650-h.p. Armstrong Siddeley Python turboprop cut back to idling r.p.m., the Wyvern is shown about to engage the arrester wires for the first time. Note the Youngman type flaps.

R.C.A.F. Fighters for Britain

EARLY in 1951, it is announced, the Royal Canadian Air Force will begin to send fighter squadrons to Britain for training. Each formation will remain here for several months.

Loopy

A MR. CARL CRAWFORD, of Oklahoma, recently executed 1,874 loops in succession, flying a Piper Super Cub. He took off, with 48 gallons of fuel, at 6.42 a.m. and had completed the performance by 11.30 the same morning. The previous record, it is reported, was 1,633 loops.

Jetliner's Visit Postponed

THE Avro Canada Jetliner will not arrive in England in time for the S.B.A.C. show at Farnborough in September, as originally planned. The aircraft's European demonstration tour has also been postponed. This news was given last week by Sir Roy Dobson, president of A. V. Roe Canada, Ltd.

Sir Roy said: "If we brought the aircraft to Europe in September-October, it would delay airline service trials by three or four months, and such interest has been shown in North America that we feel it wise to get on with the business and let showmanship come later."

New Record Rules

IMPORTANT changes in F.A.I. regulations governing the world's air-speed record, effective from July 1st, are announced by the Royal Aero Club. Speed-record contenders will be able to fly at any height (instead of below 500 metres, as formerly), and they will have to make two timed runs over a 15-25 km course (four runs over a three-km course were previously required). In addition, aircraft may now be launched from other machines if necessary.

The present speed record, held by a North American Sabre, is 670.981 m.p.h. Such research aircraft as the Bell X-1 and Douglas Skyrocket should now be able to beat the record, under the new conditions, by a fairly large margin. The F.A.I. has also introduced a new record category, for rates of climb to five heights up to 15,000 metres. The experimental Avon-powered Meteor—to name one British aircraft—might well capture all five records.

Curtiss Rocket Progress

UNLIKE most American jet fighters, the Republic XF-91 interceptor employs, instead of afterburning, tail-mounted rockets for brief periods of increased thrust on take-off or the climb. Flight tests of the XF-91 have so far been made without the rocket motors, two of which are to be mounted above the tail-pipe and two below. The propeller division of the Curtiss-Wright Corporation will, however, shortly deliver the four units, each of which will produce 4,000-lb thrust.

Curtiss-Wright are also producing the rocket installation for the Bell X-2 supersonic research aircraft, an advanced development of the successful X-1. The new research aircraft is to have two rocket motors, one of which will give 10,000-lb thrust and the other 5,000-lb.

NEWS IN BRIEF

MR. R. DIXON SPEAS has been appointed United States representative of A. V. Roe, Canada, Ltd. His headquarters will be at La Guardia Field, New York.

* * *

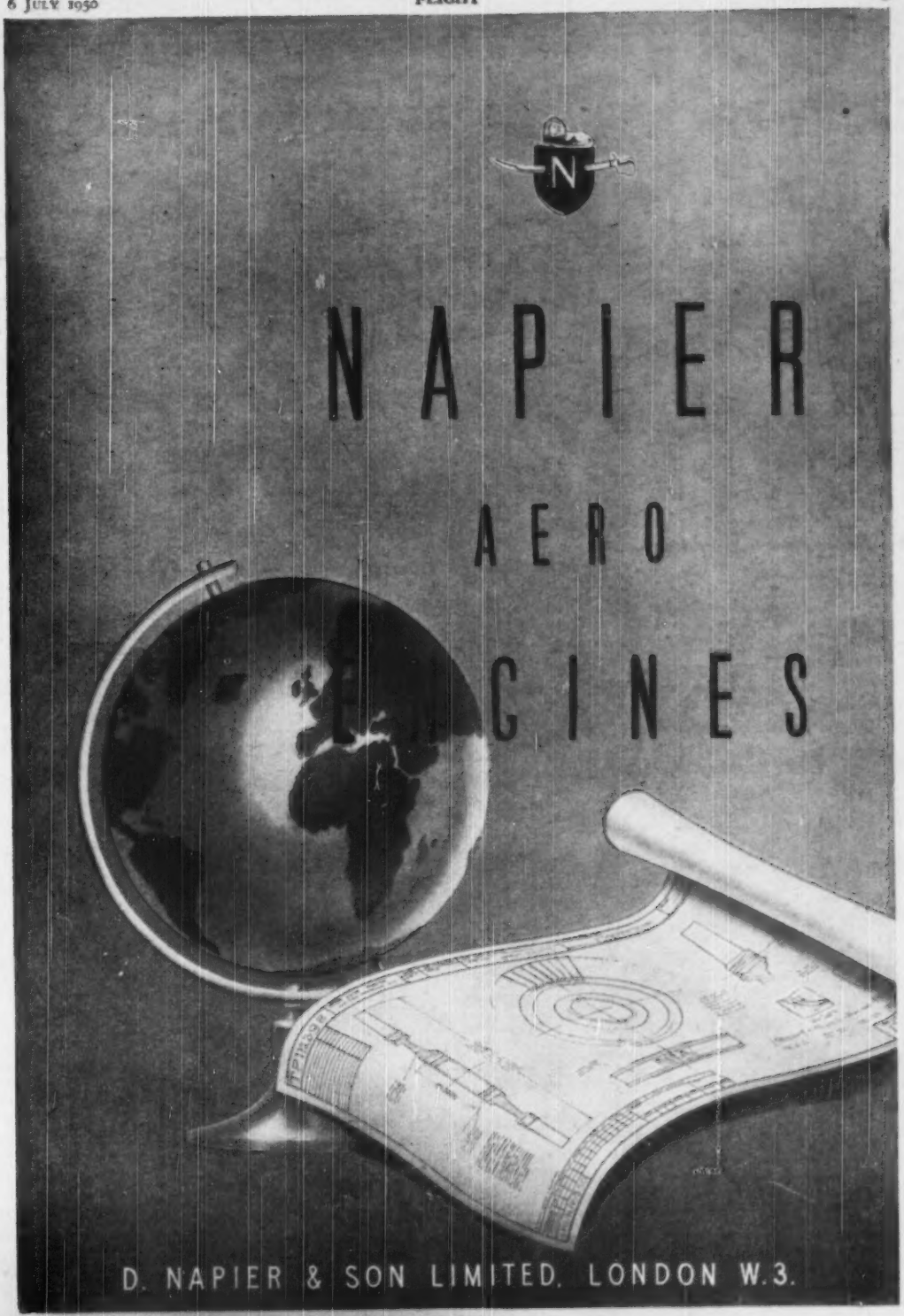
Overload flight tests were recently made by the U.S.A.F. with a Boeing C-97A Stratofreighter and a Boeing B-50. The C-97A took off at a weight of 174,500lb, 26,500lb above its normal all-up-weight; the B-50, which has a maximum a.u.w. of 164,000lb, was flown at 173,000lb.

* * *

The Republic Aviation Corporation points out that 1,000 miles is the combat radius of its F-84E Thunderjet (when fitted with four external fuel tanks), rather than the range, as implied in our issue of June 1st. The actual range is about 2,500 miles.

* * *

The F.A.I. announces homologation of four new records, three of them British. The performances confirmed are the D.H. Comet's flights between London and Cairo (425 m.p.h., out; 386 m.p.h., return); J. Cooksey's 511 m.p.h., 1,000-km closed-circuit in a Meteor 8; and Mrs. A. Branger's climb to 24,000ft in a Piper Cub.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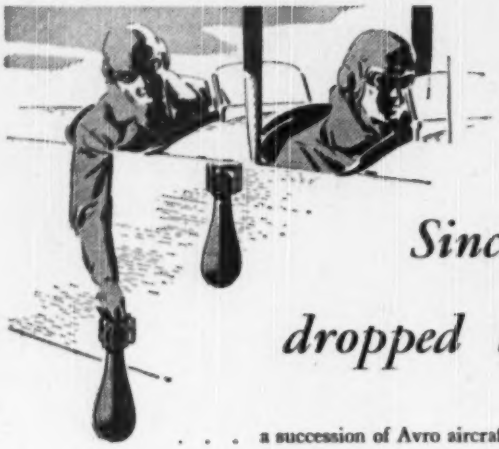
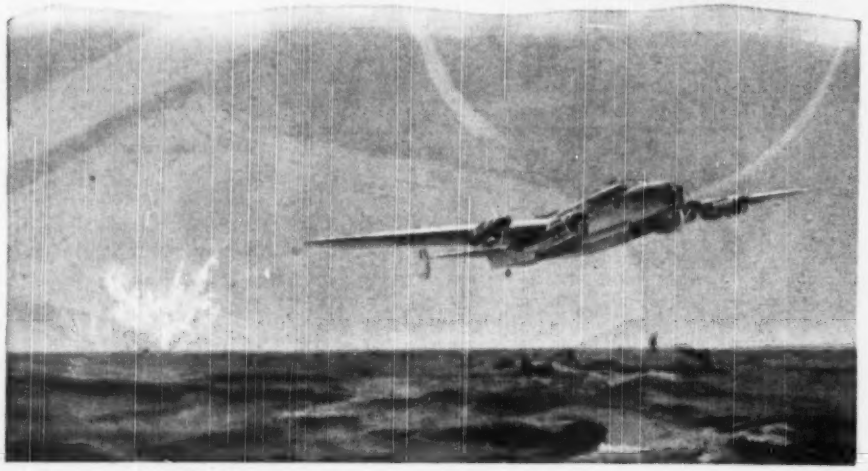
AVRO AND THE ROYAL AIR FORCE



Since bombs were dropped by hand . . .

. . . a succession of Avro aircraft have been standard equipment in the R.A.F.—the 504 of World War 1, the Tutor trainer, Ansons of Coastal and Flying Training Command, and later, the Lancasters and Lincolns of Bomber Command fame. Now, in this same tradition, the Avro Shackleton will provide Coastal Command with a reconnaissance aircraft which sets an entirely new standard for aircraft of this type.

AVRO



A. V. ROE & COMPANY LTD., MANCHESTER (MEMBER OF THE HAWKER SIDDELEY GROUP)

CIVIL AVIATION NEWS

LONDON AIRPORT TERMINAL

THE Minister of Civil Aviation, Lord Pakenham, has announced an important change in the plan for the construction of London Airport's terminal building. It was previously intended to make the final design of this building the result of a public architectural competition, and, in the meantime, to construct buildings of a temporary nature in the airport's central area. Lord Pakenham now states that, due to pressure on space in the central area, this transitional plan cannot be carried out; construction of a permanent terminal building is therefore now being planned.

Mr. Frederick Gibberd, F.R.I.B.A., A.M.T.P.I., has been appointed architect for the permanent building. Mr. Gibberd is well qualified to undertake this formidable task, since, from 1948, he has acted as consulting architect for the interim scheme, and has therefore a wide knowledge of the traffic and allied problems peculiar to London Airport.

THE OTHER BATTLE

BACKED by the U.S. Department of Justice, and with the aid of a fighting fund subscribed among themselves, nearly 100 American non-scheduled charter companies have banded together to contest a proposed C.A.B. ruling which would restrict their activities to no more than three flights in any one direction during four consecutive weeks. The "irregular" operators claim that, if implemented, this legislation would put them out of business entirely; the effective date of the offending proposal is at the moment July 7th.

Regular airlines are alleged to have brought pressure to bear on the C.A.B. to eliminate non-scheduled operators who, by virtue of reduced fares, are attracting thousands of passengers who would not otherwise travel by air. At present such operators are permitted to make eight flights in the same direction in any four-week period.

The Department of Justice has stated, however, that the continued operation of large "irregular" operators is "in the public interest," and points out that it was largely due to the initiative of these companies that the potentialities of all-freight and passenger coach services have been developed. In the opinion of this authoritative body, the certificated carriers, finding that business developed by non-scheduled operators is becoming profitable and substantial, are now endeavouring to divert this business to themselves exclusively.

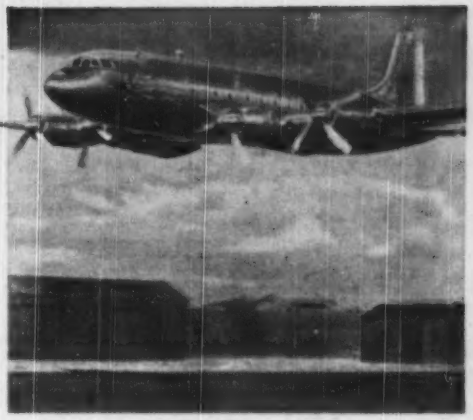
The U.S. Assistant Attorney-General has called for a full-scale investigation before any revision of the existing regulations is put into force.

B.O.A.C.'s AFRICAN ROUTES

IN a joint announcement, B.O.A.C. and South African Airways have issued details of their new services on the London-Johannesburg route which will be brought into operation later this year. B.O.A.C. is to use pressurized Hermes IVs on flights to be made three times weekly in each direction *via* Tripoli, Kano, Leopoldville and Livingstone, while South African Airways will replace the Skymasters in use on its present services with Constellation 749As, which will operate three times weekly in each direction *via* Nairobi, Khartoum and Rome.

S.A.A.'s first Constellation service is scheduled for August 26th, and B.O.A.C.'s first Hermes flight on the Johannesburg route is expected in mid-October. Existing Solent flying-boat services between London and Nairobi, and the York flights between London, Kano, Lagos and Accra will be progressively replaced between August and September.

Greater utilization and the elimination of eleven costly flying-boat bases are expected to result in large savings in overhead costs for both airlines.



AFRICAN SPEEDBIRD: One of the Handley-Page Hermes IVs which, as recorded below, will soon go into service on B.O.A.C.'s African routes. Twenty-five have been ordered.

JETLINER PROGRESS

EXCELLENT serviceability is reported to be an outstanding feature of the Avro Jetliner trials in the course of which, to date, it has logged more than 100 hours flying time. To accelerate the granting of its C. of A., the aircraft has recently been making as many as five flights a day. The Jetliner has attained over 500 m.p.h. in level flight and reached a height of 39,500ft. (The normal cruising altitude is 30,000ft.)

The manufacturers report that "numerous three-engined take-offs have been made at various speeds and at maximum gross weight," and that on several occasions on which the aircraft was flown under the power of only one turbine it maintained height at a steady 200 m.p.h. A number of flights made at cruising altitude over an 800-mile triangular course have shown consumption to be about 1,600 Imperial gallons for two hours' flying time. The best approach speed has been found to be 125-130 m.p.h. initially, reducing to 115-120 m.p.h. over the "hedge." Touch-down occurs at 95-100 m.p.h.

BREVITIES

AT the conclusion of the I.C.A.O. Fourth Assembly at Montreal, Dr. Edward Warner was elected to serve for a further three-year term as president of the I.C.A.O. Council.

* * *

The Government of Ceylon and Australian National Airways are reported to have reached an agreement concerning the joint operation of Air Ceylon; A.N.A. will provide 49 per cent of the corporation's capital.

* * *

The French National Assembly has allocated funds for the construction of the first series of fifteen S.E. 2010 Armagnac transports. Meanwhile, at St. Nazaire the twelfth aircraft of the S.O. 30P Bretagne series is engaged on flight trials; it will shortly be used experimentally on commercial routes.

* * *

The C.A.A. has placed an order with the Bendix Aviation Company for 28 radar sets to be installed at U.S. airports. Of these, fourteen will be "precision approach radar" units for G.C.A. purposes, while the remaining fourteen will be of the "airport surveillance radar" type which scans over a radius of 30 miles. The eventual plan for coverage of the U.S.A. calls for 96 of the former and 172 of the latter type.

* * *

It is learned that the International Rally which was organized for July 29th to 30th by the Aéro-Club de Touraine has now been cancelled.

* * *

Israeli National Airlines will shortly commence operations on a route from Tel Aviv to New York via Shannon and Gander. DC-4s will be used at first, but Constellations will be introduced at a later date. The first proving flight was due to arrive at Shannon on Sunday, July 2nd.

* * *

No fewer than fifteen Eon Olympias are among the thirty gliders entered for the British National Gliding Contests, to be held at Great Hucklow, Derbyshire, between July 29th and 30th. Five other machines are two-seaters. Representatives of the Services total more than one-third of the entire entry.

MANNING the R.A.F.

A Simplified Guide for Intending Entrants in Various Categories

UNDER to-day's conditions of new man-power expansion following so quickly upon elaborate demobilisation, and because the Royal Air Force is such a highly mechanised and technical Service, it is understandable that entry schemes, both for commissioned and other ranks, should at first glance appear somewhat complicated.

When the various opportunities are set out clearly and concisely, however, as they are below, they are simple enough to understand. From a few minutes' study of these notes any intending entrant, whatever his or her age or qualifications, should be able to decide what to apply for.

The proportion of regular personnel to National Servicemen in the R.A.F. is very nearly two to one. National Servicemen now make an indispensable contribution to the man-power requirements of the Service, but it is on the solid foundation of the cumulative skill and experience of the Regular Air Force that their contribution is superimposed.

OFFICERS

All peacetime officers, except in the professional branches, are normally required to undertake a period of service in the ranks. There are five main channels through which the Service obtains its commissioned officers:—

(1) Cadetships.—Cadetships are awarded for training at the R.A.F. College, Cranwell, for permanent commissions in the General Duties (flying), Equipment and Secretarial branches. Cadetships are granted, too, for training at the Royal Military Academy, Sandhurst, for permanent commissions in the R.A.F. Regiment. Cadets are appointed following a competition held three times a year. This competition is held in two parts—a written examination set by the Civil Service Commission and special selection tests set by the R.A.F. The normal field of entry is from schoolboys between 17½ and 19 years of age who hold the School and Higher School Certificate.

In addition, proficient A.T.C. cadets, R.A.F. aircraft and administrative apprentices who have completed their apprentice training, and serving airmen, including National Service airmen, who possess the necessary qualifications are eligible.

(2) Short-service Commissions.—Short-service commissions are granted for a fixed period of years of active service, followed by four years on the Reserve. These commissions are available in the General Duties (flying), Technical, Equipment, Secretarial, R.A.F. Regiment, Fighter Control, Airfield Construction, Medical, Dental, Chaplains, Education, Provost, Catering and Physical Fitness branches. Conditions of entry and of service vary according to the branch. Generally, these commissions are open to suitable candidates from civil life—and to National Servicemen—of good education. For the specialist branches, specialist experience is usually required.

(3) University Entry.—Under a special scheme, university graduates are eligible for direct appointments to permanent commissions in the General Duties, Technical, Equipment and Secretarial branches and in the R.A.F. Regiment.

(4) National Service Commissions.—There are two schemes enabling National Service entrants to become officers during and for the remainder of their 18 months' whole-time service.

(a) University graduates with suitable professional qualifications are commissioned in the Technical, Equipment, Secretarial, R.A.F. Regiment, Fighter Control, Airfield Construction, Medical, Dental, Education and Physical Fitness branches. Doctors and dentists will be commissioned on entry, as flying officers. Graduates who have served with a University Air Squadron are eligible for pilot training and may be recommended for immediate commissioning if they have had the necessary flying experience. If not eligible in this way, they can be commissioned as pilot officers on completing satisfactorily their flying and officer training.

(b) Selected National Servicemen, other than university graduates, are eligible for commissions in the Equipment, Secretarial, R.A.F. Regiment, Fighter Control, Education, Catering and Physical Fitness branches. Commissions are granted in the rank of pilot officer on successful completion of recruit, professional and officer training, which takes six to eight months.

(5) Regular Airmen.—Aircrew and airmen on regular engagements are eligible to be recommended for permanent commissions. Selections are made from candidates between the ages of 25 and 30 and, in certain cases, above the age of 30 provided they are suitable.

AIRCREW

Pilots and Navigators.—The current scheme for direct-entry pilots and navigators reflects post-war manning trends. The greater size and complexity of aircraft to-day involve increased responsibilities for pilots and navigators and demand increasingly the status associated with commissioned rank, while the length of service has to be related to the high cost of training.

Volunteers from civil life for pilot and navigator duties consequently engage for eight years' regular and four years' reserve service. In every case where the selection board is satisfied that a candidate, at the time he enters, is of the standard for commissioned rank, he is guaranteed a short-service commission on completing satisfactorily his initial and applied, basic, flying training and officer training. For those not so selected on entry there are opportunities later for commissioning. No percentage limitation is placed on the number of short-service commissions granted. All short-service officers are eligible for permanent commissions.

Candidates must be unmarried, and between 17½ and 24 years of age, but, exceptionally, entrants may be considered up to the age of 25. All are required to have reached a standard of education represented by a General or First School Certificate.

Signallers and Engineers.—This scheme is designed to attract young men of good educational standard who are capable of becoming efficient members of an aircrew. The term of engagement, qualifications on entry and length of training are generally the same as those for pilots and navigators, and candidates, in exceptional circumstances, can apply up to the age of 25. They will be eligible for re-engagement to complete 22 years' service as aircrew and for permanent commissions in ground branches.

National Service.—National Service airmen now can become pilots (up to "wings" standard), aircrew engineers or aircrew gunners during their 18 months' whole-time service. All airmen, both regular and National Service, provided they are within the age limits and have the qualifications, are eligible to be considered for aircrew engagements for which there are vacancies.

AIRMEN

Recruits for regular service on ground duties are accepted between the ages of 17½ and 31.

Trades in the R.A.F. number nearly 100 and are divided into four categories, ranging from the highly skilled duties in Group A to the less skilled of Group D.

Recruits can sign on for any of the following regular engagements: five years followed by four on the reserve; ten years followed by two on the reserve; twelve years' regular service. They undergo special tests and are interviewed to fit them into an acceptable and progressive trade. Tradesmen in Groups B to D are given further training to enable them to transfer to more skilled work in their trade, or they can transfer to a higher-paid trade if they qualify by their own efforts. Advancement to N.C.O. and warrant rank is made to fill establishment vacancies and there are opportunities for commissions or aircrew training.

NATIONAL SERVICE

Two new regular engagements have been introduced specially for National Servicemen who normally undertake 18 months' whole-time and four years' reserve service:—

(1) A National Service airman can elect for three years' whole-time service instead of his statutory 18 months and becomes entitled to all the privileges of the regular airman.

(2) The other scheme enables a National Service airman, at any time during his whole-time service, to sign on for three years' whole-time National Service and regular service combined.

Both engagements comprise regular and reserve service totalling 5½ years, which is equal to the total period of whole-time and part-time service required of airmen serving under the National Service Acts, 1948.

OPPORTUNITIES FOR BOYS

Apprenticeship schemes have been invaluable to the R.A.F. in providing future skilled personnel and a cadre of flying, technical and administrative officers who make the Service their career.

There are three schemes, which enable boys between 15 and 17½ years of age to enter the Service and to receive free technical and general education comparable to that of public schools:—

(1) Aircraft Apprentices.—Candidates sit for a special qualifying examination followed by aptitude, intelligence and medical tests. Successful candidates are admitted to the R.A.F. Training School at Halton, Bucks, or Cranwell, Lincs. Entrants must be educated up to grammar, modern or technical school standards for boys of 15. They serve an apprenticeship of three years, plus one year on a variety of productive work.

(2) Boy Entrants.—Candidates must be of good general education—an A.T.C. Proficiency Certificate is accepted—and if selected receive eighteen months' technical and educational tuition at R.A.F. Training Schools at Cosford, Compton Bassett or Yatesbury. They have no written examination, but attend at a Selection Centre.

(3) Administrative Apprentices.—Candidates, who should possess the School Certificate or equivalent, are selected by medical and aptitude tests. If successful, they undergo 16 months' training at St. Athan, near Barry, plus eight months on productive work.

Most of the conditions of service and opportunities are common to all three schemes. Apprentices and boy entrants are fully provided for and are paid while on training, with six weeks' holiday and three railway warrants each year. Under training, apprentices and boys are paid from 10s 6d to 28s a week, depending on age and service. On completion of training, provided they are 17½ or over, they receive full R.A.F. rates.

All entrants undertake to be embodied into the regular Service at 18. Apprentices serve until they are 30 years of age, but boy entrants can serve until they are 26, 27 or 28. All are eligible for re-engagement to complete 22 years of service—which qualifies them for a pension—and all are eligible for permanent commissions. Those who later transfer to the General Duties (flying) branch are eligible, as pilots or navigators, for a short-service commission.

Conditions for entry in the Women's Royal Air Force are generally similar to those outlined above. Further information is obtainable from R.A.F. Recruiting Centres.

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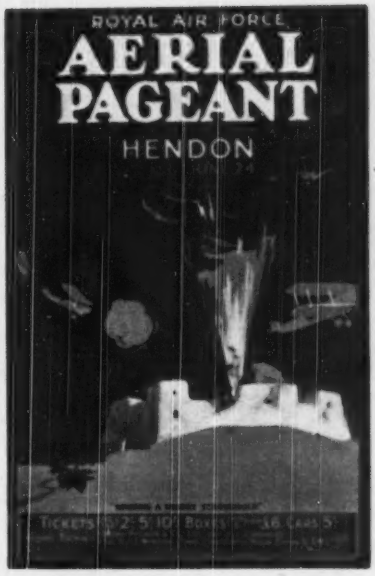
MEMORIES OF HENDON

Some Nostalgic Recollections of Bygone Royal Air Force Displays



The poster announcing the 1922 pageant depicted the theme of the year's set-piece—an attack on a fortress of the treacherous Wottnot tribe

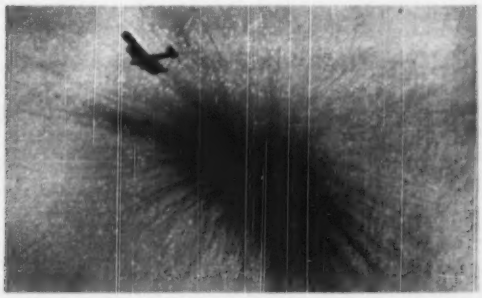
(Illustrated by "Flight" photographs)

HOW far away it all seems now—the jostling crowds in Colindale Avenue on those bright summer mornings, with the heat haze shimmering over the railway bordering the aerodrome (for the Hendon of the intimate old Displays was never an "airfield"); the rows upon rows of silver and olive biplanes distantly glimpsed across the grass, with the "see-it-for-nothing" crowds beginning to mass on Mill Hill beyond; and the all-pervading impatience for the thrills to come. For Hendon never disappointed. Grey days there were—though happily few—and every year there was the grim prospect of getting home through record traffic jams or in suffocatingly packed tube trains; but the Display itself was always worth the effort and discomfort. It was, of course, far more than a mere air display: it was the great Service reunion and the culmination of training programmes. Junior officers, now "brass"-encrusted or long since missing from the Air Force List, met their friends in cool marquees over "half cans" or long gin-and-tonics, while small boys, programme in one fist, ice-cream in the other, goggled at the new and experimental types fenced in near the public enclosures. How many of these same small boys were to win their D.S.O.s and D.F.C.s in machines which made the most admired prototypes of their schooldays seem quaintly old-fashioned!

They were warm, colourful days, now, already, "in the distance enchanted" and never, perhaps, to return; but this week-end at Farnborough will open a new series of Displays, necessarily different in character but, we may be sure, no less memorable and inspiring.

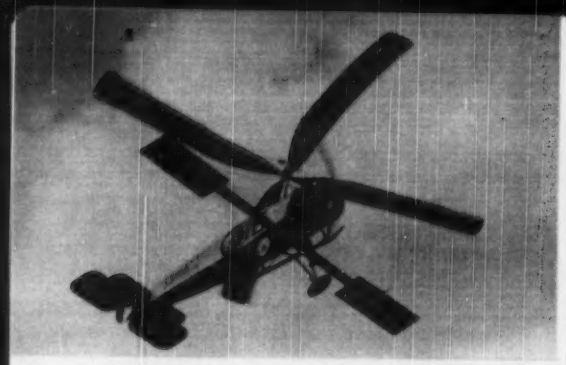
The fortunate possessor of *Flight's* Display reports dating back to the first may read how, in 1920, the "Royal Air Force Aerial Pageant" (a description which died hard) was, according to editorial pronouncement, "by a long

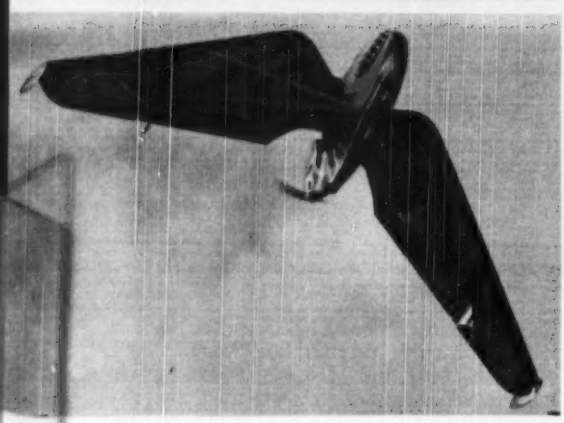
An outsize smoke bomb, delivered by a Handley Page O/400 in 1923.

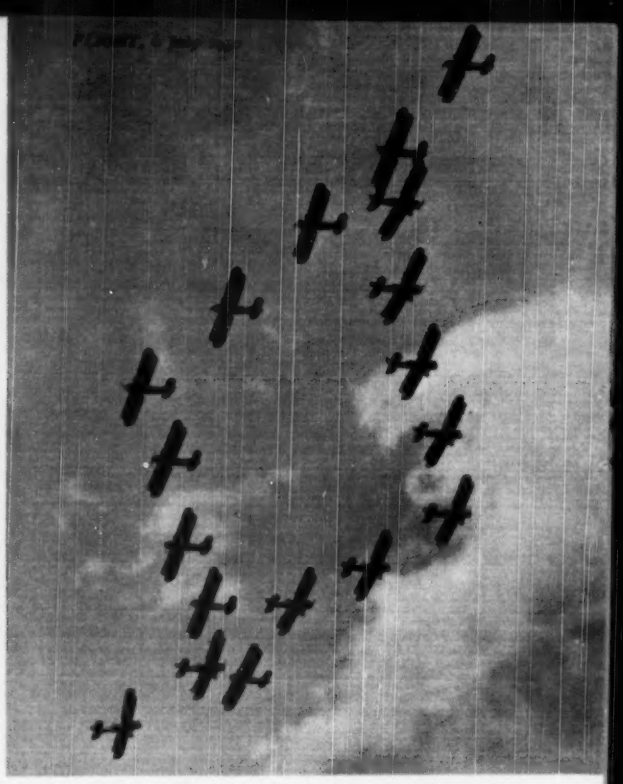


Their Majesties King George V and Queen Mary arriving in 1923.

A Martinsyde Buzzard and an authentically marked Fokker D.7 parked like lambs before joining ferocious combat in the 1920 display.







Like so many pioneers, the Westland-Hill Pterodactyl (lower left) and (above it) the early rotary-engined Cierva Autogiro evoked universal laughter—though only on account of their deliberately fantastic performances. Especially memorable was the appearance of these historic machines in 'circus' formation with the Handley Page Gugnunc. On right, D.H. 9As are passing below the same number of Fairey Fawns.

way the most successful aerial affair which has ever been held, in this country at least." H.R.H. Prince Henry honoured the occasion (the presence of the King and Queen and other Royal personages was often to be recorded in later years), and top-hatted Winston Churchill was there on that magnificent day, with its loitering, thundery clouds. The programme quoted the war records of pilots in the cross-country race (one officer had "34 Huns and 16 balloons" to his credit), and the aircraft, of course, were of wartime vintage—Avro 504s, Bristol Fighters, Snipes and Camels, and Handley Page V/1500s. Civilian turns—a parachute descent by 21-year-old Sylva Boyden, and aerobatics by Harry Hawker in his Sopwith Swallow—contributed to the spectacle. A Martinsyde engaged a Fokker D-7 in combat, and there was a hearty bombing display by Handley Pages.

In 1921 the airship R-33 patrolled throughout the day, giving radio assistance to the police in preventing traffic jams and presenting "a most picturesque aspect—at one time looking like burnished silver; or dark and sinister like a shark; then ghost-like, apparently semi-transparent, fading away into the fleecy clouds." F/O. P. W. S. Bulman performed engagingly in a blue B.A.T., and a Siddeley Siskin, pitted against a Nieuport Nighthawk, evoked the comment by *Flight* (in the still-current jargon of the Kaiser's war) that "the Siskin is certainly some bus." A formation of Brisfits, with a certain F/L. J. M. Robb, D.F.C., as one of the pilots, was set upon by a Camel, and a "B.E.2 XYZ," with smoking chimney, forward/backward stagger and auxiliary undercarriage-cum-weather vane on the top wing, earned the laughter that came so readily in those unsophisticated days.

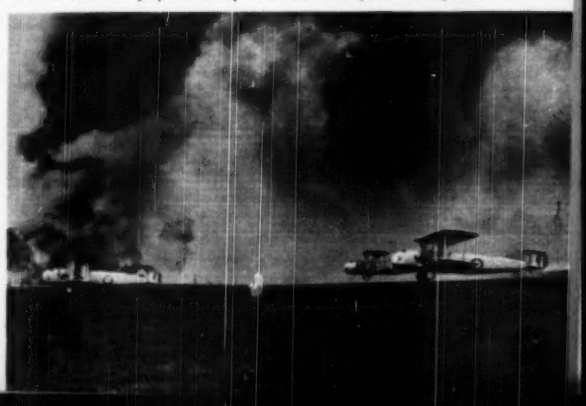
Next year came rain, but 60,000 people watched another great show. The field for the inevitable race must have exercised the spotters of the day, including as it did an Avro 504, Vickers Vimy, Brisfit, S.E.5A, D.H.9A, Martinsyde Buzzard, Sopwith Pup, two varieties of Westland Weasel, an Avro Aldershot and a Snipe. The finale was a powerful Eastern drama, depicting the attack on, and destruction of, a desert stronghold and involving armoured cars, hordes of hostile Wottnots, a force-landed Brisfit and avenging bombers.

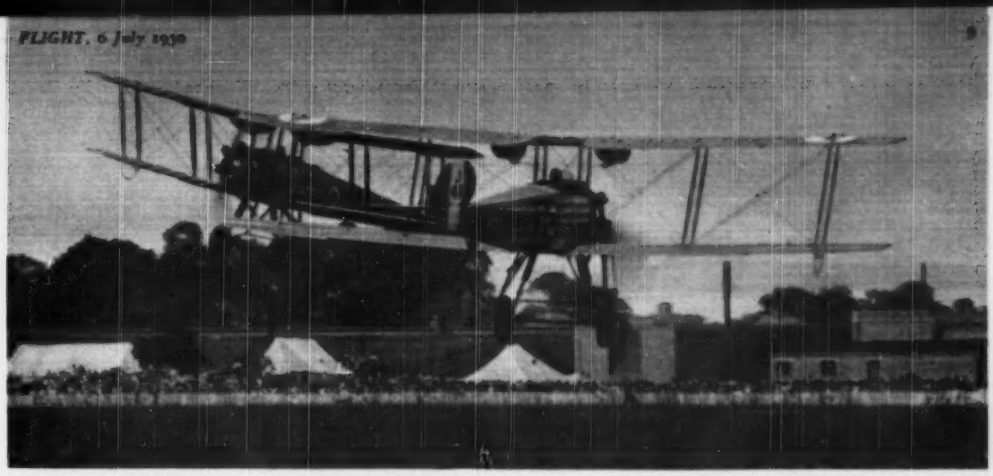
Exemplifying the training value of the Display was the photographic competition in the 1923 programme; but spectacle was not lacking, especially when the sprightly Bourges bomber led a pair of Nighthawks a dance. The new and experimental types ranged from the ponderous Aldershot bomber to the nominally 3 h.p. A.B.C.-engined Wren, and including a Walrus (the Westland, not the later Supermarine, variety), Flycatcher, Plover, Hanley, Fawn and Grebe. Five S.E.5As looped, rolled and spun together.

Better than ever was the 1924 effort, featuring, *inter alia*, message picking-up and a stirring show by French Nieuport-Delage fighters. New aircraft names included Hyderabad, Venture, Dormouse, Bullfinch and Woodcock, and air drill by D.H.9As of 39 and 207 Squadrons was declared to be the finest flying display seen up to that time, both from the spectacular and the technical point of view. Finally, there was an astonishingly realistic torpedo attack by Darts on two large "steamships."

By 1925 *Flight* was referring to the "good old Snipe,"

Vickers Victorias played their part in the smoky 1927 set-piece.





Stilty, Lynx-engined Avro 504N trainers, appear horrifyingly tangled in a scene reminiscent of many classic crazy-flying performances.

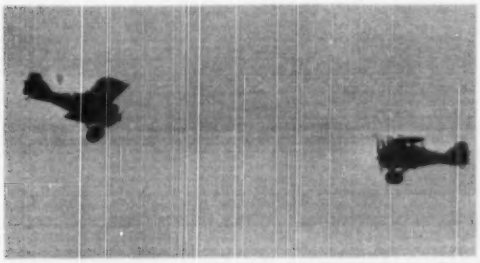
MEMORIES OF HENDON . . .

which was still in evidence. Certainly fighter design had advanced, as F/L. Bulman proved by his handling of the Hawker Heron. S/L. Peck's commands to his Grebe squadron were relayed by the British Broadcasting Company *via* 2LO and 5XX, and the King himself directed the fighters at one stage. "Immediately," ran *Flight's* account, "the leader executed a loop and a half-roll from the top, while the others turned sharply—and there was the formation once again in double line ahead, but flying in the opposite direction." A Bugle—of the Bourges family—defied a section of Grebes and there was parachuting from Fawns.

The year 1926 brought an innovation—a long-distance reliability trial for Virginia and Hyderabad night bombers. The message pick-up included No. 4 Squadron (S/L. J. C. Slessor, M.C.) and No. 16 (S/L. W. A. Coryton, M.V.O., D.F.C.). The Gamecock, Gorcock, Snipe, Siskin and the sensational Condor-engined Hornbill, were all shown off. Capt. F. C. Courtney hovered in the Cierva Autogiro. At one time the Pterodactyl, Sprat, Vendace, Gorcock, Hornbill, Avenger, Firefly (Felix), Atlas, Boarhound, Hyena, Vespa, Fox, Horsley, Ava, Argosy and Autogiro were all in the air together.

Next year—1927—two crazy-flying Lynx-Avros played

Gamecocks tête-à-tête at the start of an aerobatic turn.



hide and seek among squadrons of 9As and Foxes lined up ready for take-off. Siskins manœuvred to music, and an aerobatic flight of Genet Moths included no fewer than four Schneider aces-to-be—D'Arcy Greig, Stainforth, Atcherly and Waghorn. There were pull-off parachute jumps from Vimys, and the prototypes of the Chamois, Goring, IIIF, Hound, Valiant, Wapiti and Bulldog were on view.

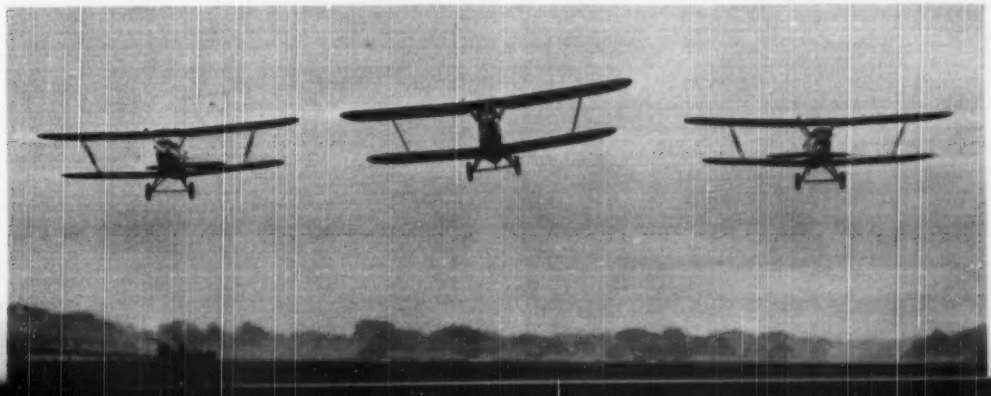
Technically, the most interesting item on the 1928 programme was a climb contest for supercharged and unsupercharged Jaguar-engined Siskins. One machine, with "blown" engine, attained 19,500ft in 15 min (to-day a Service Meteor would get there in about 3½ min). This was the year when the great Beardmore Inflexible (someone, of course, dubbed it Inexplicable) was present, in company with the Partridge, Hawfinch and Wizard. Of low bombing by the Fairey Foxes *Flight* said, "We have still got headaches and what nerves we had left are now gone."

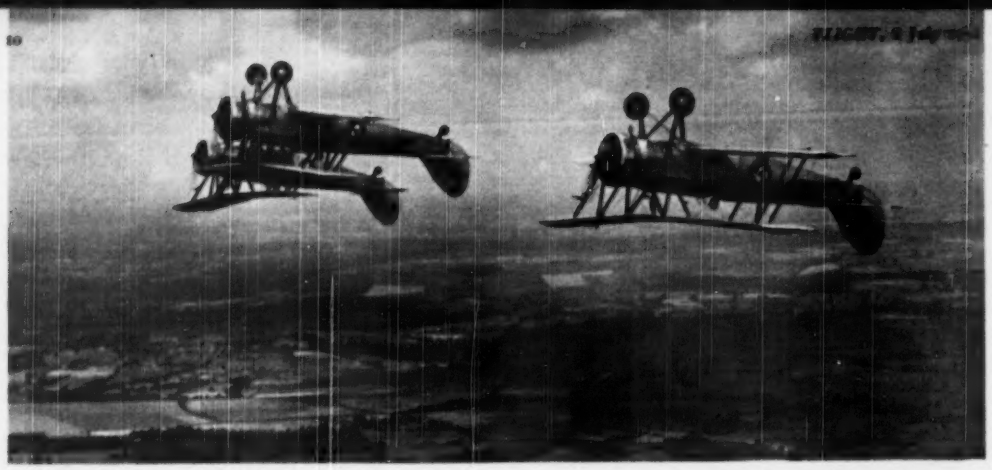
Five Southampton flying boats introduced a robust maritime note into the 1929 Display, and in 1930 "lighter than air" was represented by the R-101. Experimental fighters included the D.H. monoplane intercepter, Blackburn Lincock and Bristol Bullpup. No. 43's squadron aerobatics on Siskins was declared "the most excellent performance of the day."

How many people now remember that in 1931 two Virginias from the R.A.E. demonstrated flight refuelling? This, too, was the year of the incredibly "dicey" converging bombing by Fleet Air Arm Flycatchers. The Auxiliary Wapitis covered themselves with glory; as *Flight* remarked, "The pick of the Regular Air Force was at Hendon and was putting up a really remarkable show; yet here was the Auxiliary Air Force inviting comparisons, showing no fear and asking no favour, and emerging from the ordeal with nothing but credit." F/L. Basil Embry led five inverted Moths and 43 Squadron introduced its new Hawker Furies. Of these it was written, "They were certainly fast, but it may perhaps be doubted that they attained the 250 m.p.h. in the dive which the loudspeakers announced"!

An elaborate display of air co-operation with ground

With their fiendishly noisy, directly driven metal airscrews, Fairey Fox day bombers were ideal for demonstrating low-flying attacks.





The top surfaces of the single-seater Avro Tutors, flown by C.F.S. instructors, were distinctively marked to indicate "wrong side down."

forces (Victoria troop carriers participated) was a 1932 feature. P/O. A. J. Pegg flew one of the sky-writing Bulldogs that year, and a new Hart day bomber showed up well against Furies.

Saro cloud amphibians, the mighty six-engined Sarafand, a Singapore II and some Southamptons boomed over the 1933 crowds, with a Moth to give scale.

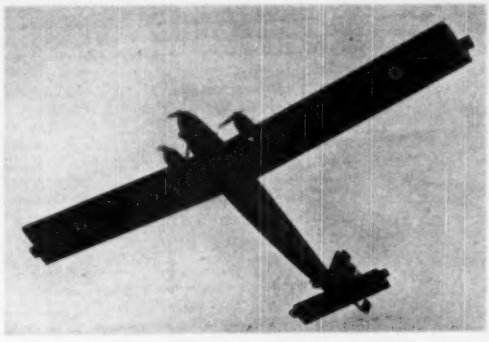
By 1934 many people felt that the Display, though still magnificent entertainment, was becoming somewhat stereotyped. Nevertheless, synchronized aerobatics by 43 and 25 Squadrons (Furies) were quite sensational, and there was an encouraging representation of new equipment.

Gauntlet fighters appeared in squadron use during 1935. Bulldogs plaited smoke trails, and experimental types included some cleverly thought-out general-purpose machines, four-gun Gloster fighter, Hawker dive bomber, and the massive A.W.23 trooper. One manœuvre—the Overstrand v. Furies combat—simultaneously stopped the breath of 200,000 people in 1936. "Irritated by a particularly persistent Fury," *Flight* records, "the Overstrand reared up on its tail, sat vertically for a moment, then stalling, flicked its nose down to past the vertical, eased out of the dive and resumed the business in hand." Formation aerobatics by F/L. Harry Broadhurst and two others evoked spontaneous applause *from the Press enclosure!* Prototypes of the Hurricane, Spitfire, Jockey, Battle, Blenheim, Lysander, Wellington, Hampden and Whitley were there.

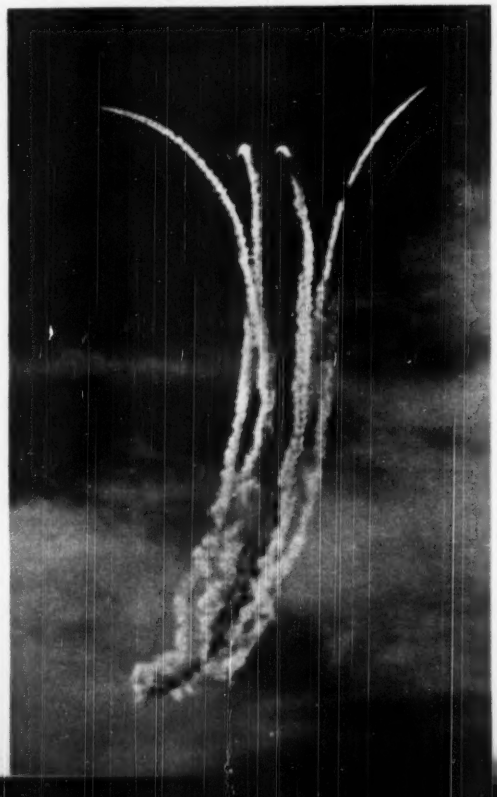
A large-scale fly-past, with Hectors, Ansons and Harrows represented the last (1937) Display. On this occasion, also, there was an elaborate set piece, with Vildebeests torpedoing lock gates. Again the Overstrand stalled sickeningly.

Early in 1938 the Air Council announced its decision to discontinue the Display, and *Flight* commented, "The reasons given are valid enough, and must be accepted, though with regret. Modern fast aeroplanes take up too much sky-room to make a realistic spectacle of Air Force work within the limits of any aerodrome. Instead of merely lamenting the past, let us see if any constructive suggestions for the future may be made."

Now, once again, the R.A.F. is triumphing over difficulties. "Per Ardua——." H. F. K.



(Above) The "sawn-off-by-the-yard" silhouette of the great Beardmore Inflexible bomber of 1928. Below is a representative manœuvre by smoke-trailing Bristol Bulldog fighters—actually during the 1934 display. Red, white and blue smoke was used.



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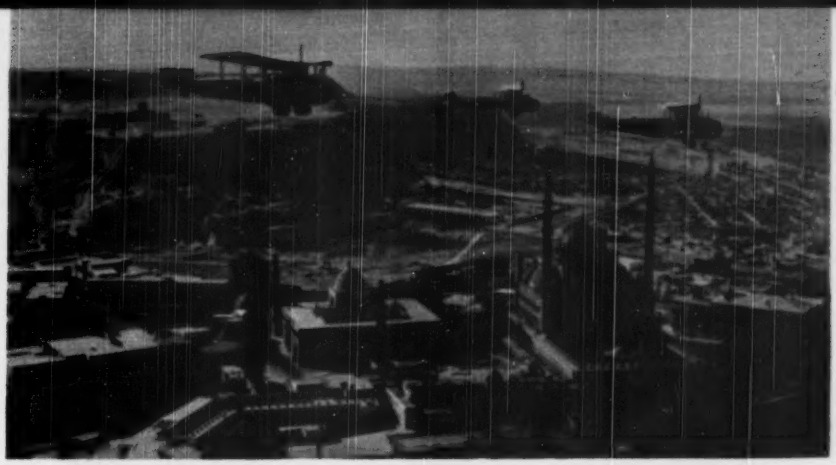


Forerunners of Transport Command: Vickers Valentias (2 Bristol Pegasus) over the Citadel, Cairo, in 1936.

(Below) In the beginning: The staff of the Central Flying School at Upavon in 1914. In the centre of the front row are Capt. G. M. Paine, the Commandant, and his assistant, then Major H. M. Trenchard.

THE R.A.F.—AN OUTLINE HISTORY

THIRTY years of fitful developments and slow progress in aeronautics had preceded the formation of the Royal Flying Corps in 1912. In the eight years which followed before the Royal Air Force was established on April 1st, 1918, the tempo was greatly accelerated under the stimulus of threatened war and of war itself. Developments in aviation were co-ordinated for the first time, an industry was created, and a powerful military force was assembled.

At Woolwich Arsenal, in 1878, the Army held a series of trials with free and captive balloons, and in the following year a unit of five balloons, manned by Royal Engineers, was set up at Woolwich. Lighter-than-air detachments soon proved their worth on active service—in the Sudan and during the Boer War. Farnborough became, in 1905, the home of the Government balloon factory, long since transformed into the Royal Aircraft Establishment. Two years later the first British dirigible, *Nulli Secundus*, was launched.

Bleriot's Channel crossing, in 1909, and several other successful demonstrations of the merits of heavier-than-air craft, were portents which could not be ignored; an Air Battalion was established in 1911, consisting of two companies, No. 1 (Airship) and No. 2 (Aeroplane). By this time the Navy, too, was at work, and had succeeded in operating aircraft both from water and the decks of ships. On May 13th, 1912, the activities of the two services were merged in the new Royal Flying Corps. This body, on its foundation, consisted of one airship squadron, two heavier-than-air squadrons, a central flying school, the aircraft factory at Farnborough, and a Naval Wing (of which the Admiralty retained control). Airship operation and development was soon handed over to the Naval Wing of the R.F.C., which in July, 1914, was re-styled the Royal Naval Air Service and detached from the Army.

When war began on August 4th, 1914, the R.F.C. had 179 aircraft (of miscellaneous design and disposition), while the R.N.A.S. strength stood at 39 landplanes, 52 seaplanes and seven airships. The airships gave "top cover" to the British Expeditionary Force as it crossed the Channel, and by August 13th the first R.F.C. aircraft were in France.

Early reconnaissance flights, which gave encouraging results, showed the need for efficient air cameras, capable of recording information that the human eye and memory could neither register nor retain; wireless sets to give clear and positive information to infantry and artillery in all weathers (Very signals were relied on at first); and armament, for ground-attack and aerial combat.

At first Germany was outnumbered in the air; during the first battles—the Marne and Aisne, Ypres, Neuve Chapelle and Loos—the R.F.C., then in a state of continuous expansion, enjoyed air superiority and utilized it well. But in July, 1915, the renowned Fokker scout, with interrupter gear enabling its machine gun to fire through the airscrew radius, made its first appearance. Fighter escorts had to be provided and formation-flying tactics were evolved, enabling observers to shield their aircraft with a pattern of defensive fire. Operations were hampered and not until the R.F.C. squadrons received F.E.2Bs and de Havilland D.H.2 fighters were the Fokkers kept at bay.

For Army co-operation, the "contact-patrol" method had been devised, whereby observers reported accurately on enemy positions, advised headquarters of their own troops' progress and transmitted messages from front lines to divisional H.Q.s. During the battle of the Somme, from July 1st, 1916, to November 17th, the Corps had expanded from 27 squadrons to

(Above) Church parade, France, 1918. The "pulpit" is an F.E.2B.

Basic trainers: Farmans and B.E.2s of the Central Flying School.

(Above) The scene at Mildenhall in 1935, when over 350 aircraft were reviewed by H. M. King George V. (Right) S/L. F. R. D. Swain, in pressure suit, leaving the Bristol 138 high-altitude monoplane.

THE R.A.F.—AN OUTLINE HISTORY . . .

35, taken 19,000 photographs, registered 8,672 targets for the artillery and dropped 17,600 bombs—a total of 292 tons.

Meanwhile, the R.N.A.S. were giving good service at Gallipoli and, nearer home, provided both defence and attack. Early in the war, submarine bases in Flanders had been bombed, "blimps" put into service and the Friedrichshafen airship sheds attacked. Of three new Zeppelins threatening Britain in 1915, the R.N.A.S. destroyed two—one in its hangar at Evere and one in the air over Ghent. In February, 1916, the War Office took over the air defence of Great Britain and finally succeeded in deterring German attack completely.

Following the success of hedge-hopping, ground-strafing raids by the R.F.C. during the Arras offensive, and the first large-scale use of fighter-bombers (S.E.5a) in Flanders, the Cambrai attack in November, 1917, was supported by a ground-attack "shuttle service" of fighters and fighter-bombers. Flying at trench-top height, in the face of heavy small-arms fire, the British pilots completed their task successfully, despite a casualty rate of 30-35 per cent.

April 1st, 1918, saw the formation of the Royal Air Force as a co-equal interdependent service. This momentous step followed the recommendations, several months earlier, of a committee presided over by General J. C. Smuts, an impartial and prophetic advisor to whom the R.A.F., as it is to-day, may indeed owe its very being. In the ensuing first seven months of its existence, the R.A.F., facing ferocious German resistance, succeeded in maintaining air supremacy until final victory, strengthened by American assistance and refreshed by re-equipment with Sopwith Camels and other excellent machines. In November, 1918, the R.A.F. had over 200 squadrons, 22,647 aircraft—of which 3,300 were on first-line strength—and 291,000 officers and men. Although fighters and reconnaissance aircraft made the major operational contribution, bombing squadrons of the Independent Air Force, established in June, 1918, had attacked airfields, transports and factories inside Germany.

Less than three weeks later, Captain Ross Smith had begun the first flight from Cairo to India, the forerunner of a series of pioneer Service flights which evolved the first long-range navigational techniques and blazed the early airline trails. Early in 1919, General Trenchard began his second term as Chief of Air Staff and energetically set about maintaining the sadly depleted R.A.F. on the most efficient lines, building a foundation for future achievements. At that time war seemed very remote, and funds for the Services were low.

The First World War was over but work was soon found for the Air Force. Following the Cairo conference in 1921, aircraft were used to control tribesmen in the Middle East (assisted there by R.A.F. armoured car formations), and later in India. This work, it was soon found, could be performed cheaply, humanely and more effectively by aircraft.

In the summer of 1919, R.A.F. short-service commissions and the present rank titles, long the subject of controversy, were introduced. The then Secretary of State for Air, Winston Churchill, introduced, on December 11th, the White Paper setting out the permanent organization of the R.A.F.

February, 1921, saw the establishment, under Trenchard's inspiration, of the Royal Air Force College at Cranwell, formerly a Naval air training base. The Apprentice School at Halton, formed eighteen months later, aimed at, and succeeded in producing a steady flow of skilled groundcrew.

Although, in 1923, the need for a strong air defence was accepted in Britain, and a decision was made to raise the home-based force to 52 squadrons, rearmament did not proceed as planned. In fact, during the 1932-34 Disarmament Conferences Britain's air power occupied fifth place among the nations. When the Conferences completely failed, sizeable increases in the R.A.F. were an urgent necessity.

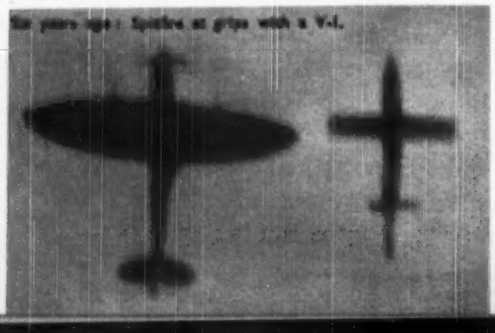
If numbers were low, technical progress and morale were high. The annual R.A.F. Displays, held since 1920, at Hendon, were an impressive and encouraging climax to the well-planned training programme; several records had been established, notably the Schneider Trophy performances of the High Speed Flight. Between 1927 and 1931, when a third R.A.F. victory won the Trophy outright, speeds increased from 282 to 340 m.p.h.; and, in 1931 also, the winning Supermarine S.6B raised the world's speed record to 407.5 m.p.h. In 1933, the Fairey long-range monoplane set up another important record by flying from Cranwell to Walvis Bay, in S. Africa (where it landed with ten gallons of fuel remaining), a distance of 5,341 miles. Three years later S/L. F. R. D. Swain took the Bristol high-altitude monoplane to 49,967ft and captured for Britain the height record also.

Such performances, backed by the less spectacular but unsurpassed training and development continuously in progress at the Central Flying School, Cranwell, Halton, and in the squadrons themselves, were building assurance of R.A.F. superiority in the forthcoming conflict.

Pre-war preparations to meet the growing threat of the Luftwaffe were more effective and energetic than conceded by contemporary critics, many of whom had objected, in May, 1935, to the Government scheme for establishing a first-line air force of 1,500 aircraft within two years. Although in 1938 strength was still insufficient, the eight-gun Spitfires and Hurricanes were in production, formidable bombers were in a fairly advanced stage of development, and expansion of both air force and industry, at a remarkable rate, was well under way. The Auxiliary Air Force, set up in 1925, had grown into an efficient, healthy supplement to the Regular Air Force, and the R.A.F.V.R., established three years before the war, was making equally good use of civilian airmindedness.

The need to replace obsolescent aircraft with all possible haste was met partly by the purchase, from America, of 200 Harvards and 200 Hudsons, and an important step also was the first adoption of the highly successful American Link ground trainer. And, though the news could not then be given, Britain was leading the way in what was to prove one of the most decisive developments in modern air warfare—radar, then known as radiolocation. By the end of 1938, British aircraft were being built at a rate of nearly 4,000 per year. When war came on September 3rd, 1939, the R.A.F., therefore, stood firm and healthy and, if initially outnumbered, supported by the resources of the entire Commonwealth. Within the scope of this brief survey it is not perhaps necessary to recount in detail R.A.F. exploits during the Second World War, but the imminent Farnborough Display is certain to be, to many, a tangible reminder of those inspiring days.

The evergreen Spitfire, though in later form, will be present to recall the Battle of Britain, already traditional, in which the R.A.F. seized, and held during the ensuing years, mastery in the air. Other Display aircraft, of relatively new design, are worthy descendants of the war-winning strain of yesterday. Much is expected from, and much depends upon, the machines and their crews, the holders of so fine a heritage.



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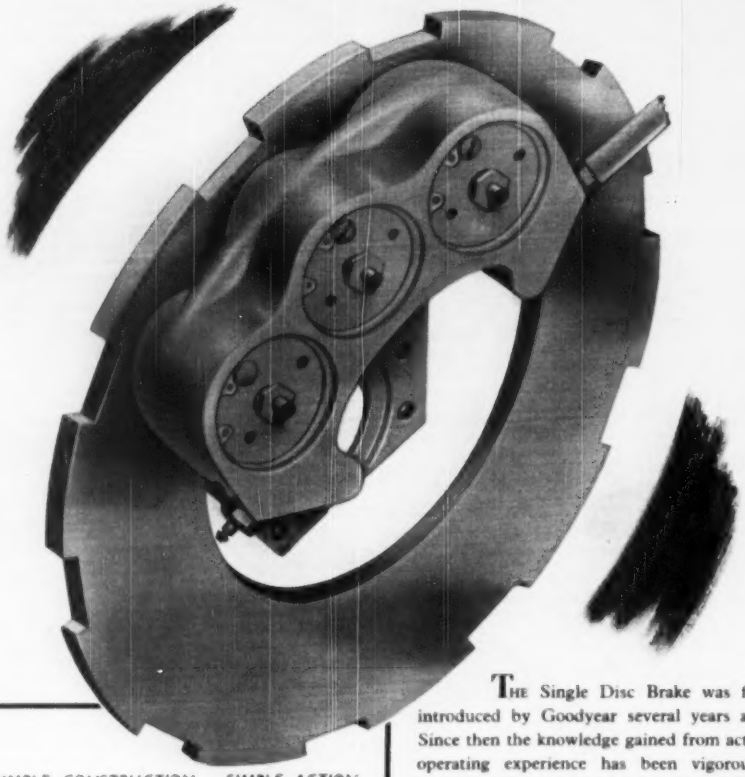

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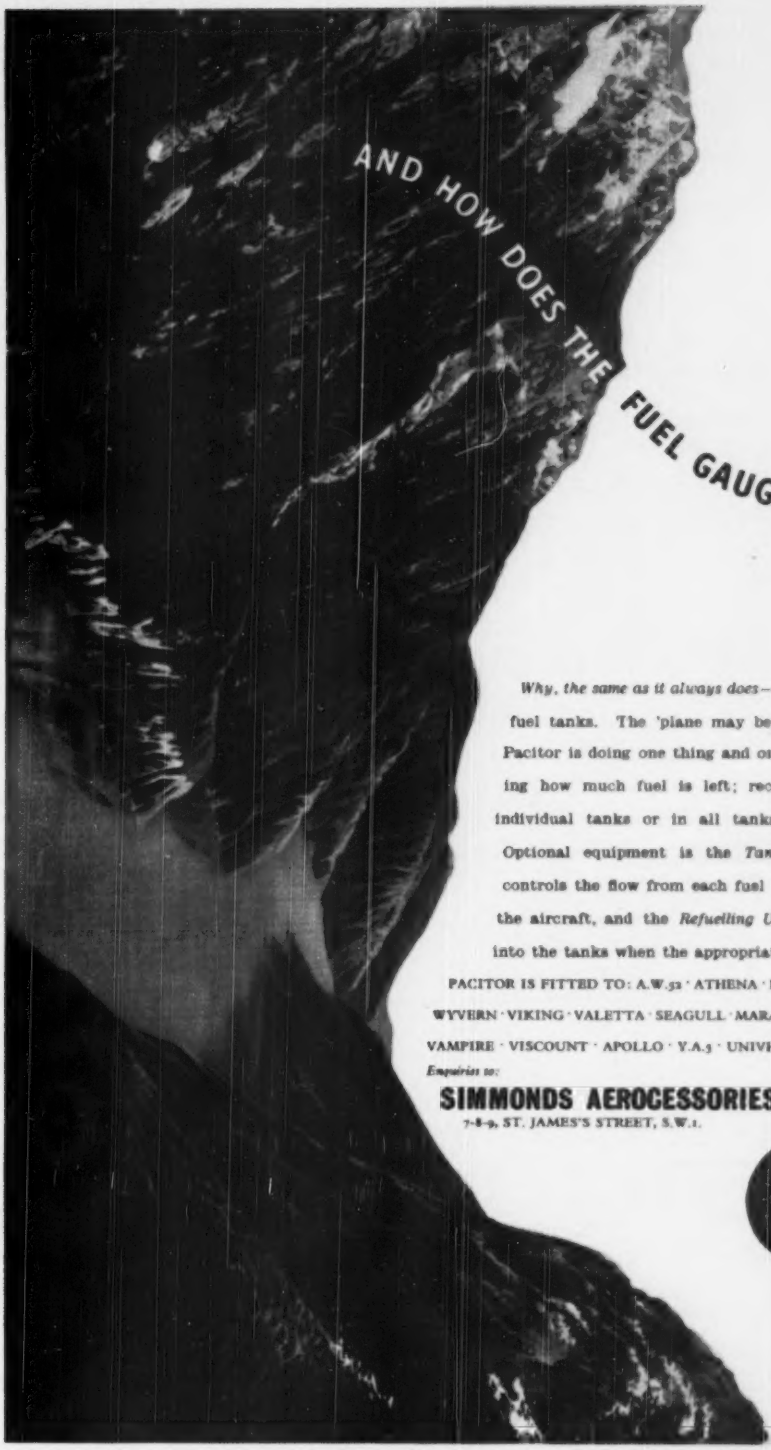

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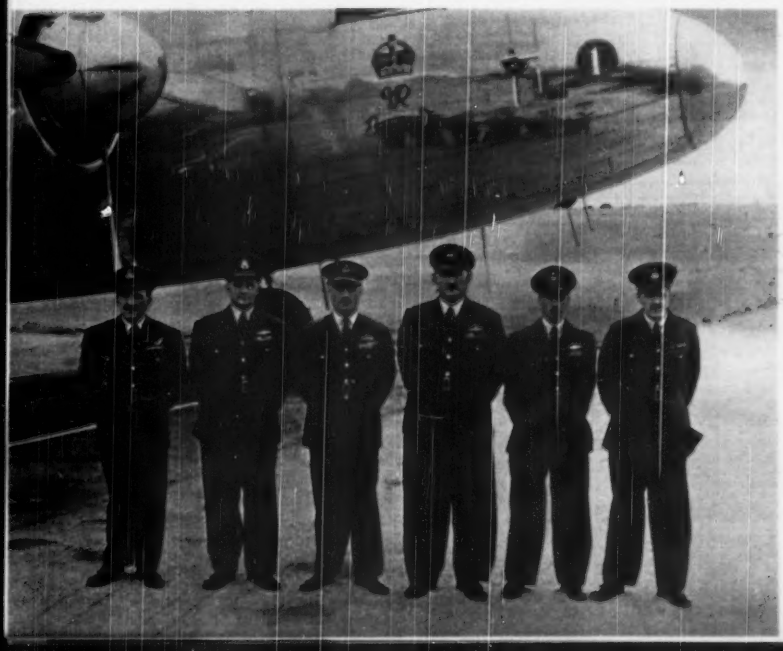

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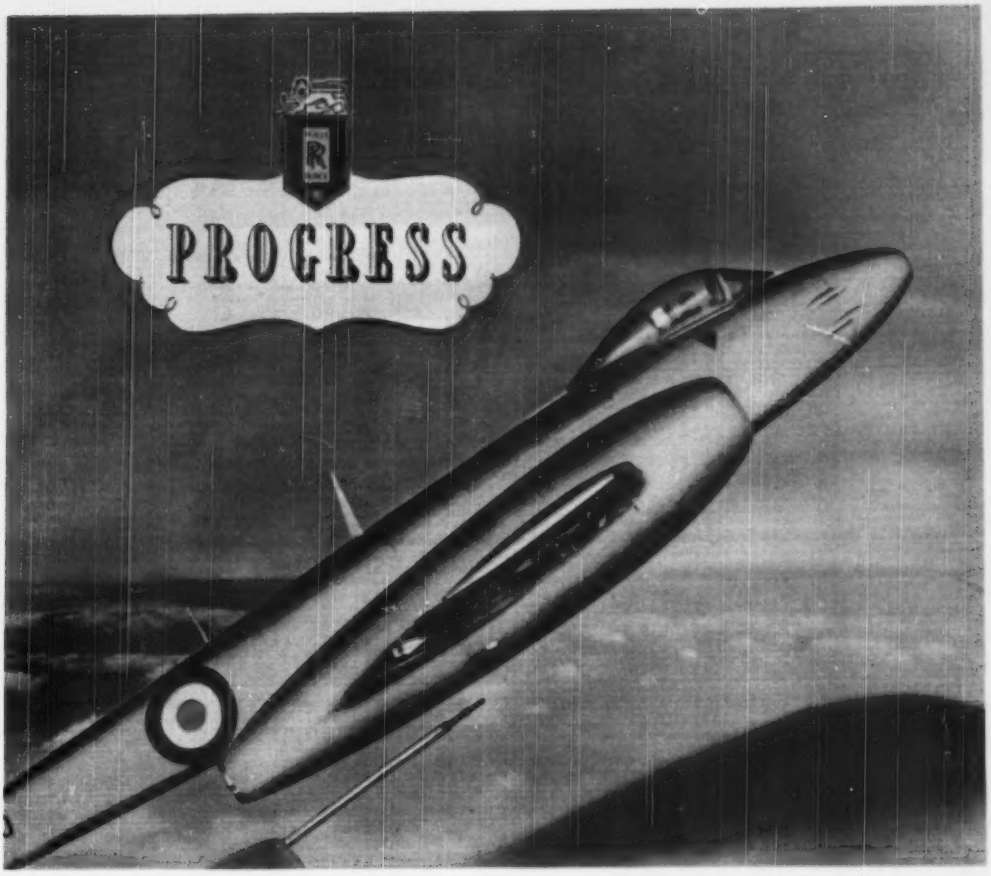
OTHER HIGHER APPOINTMENTS

(l. to r.) Air Chief Marshal Sir James M. Robb, Commander-in-Chief Headquarters Air Forces Western Europe; Air Chief Marshal Sir George C. Pirie, Head of Air Force Staff, British Joint Services Mission (U.S.A.); and Air Marshal Sir Hugh W. L. Saunders, Inspector-General of the Royal Air Force.

Portraits of the Secretary of State for Air and the Chief of the Air Staff (and of their immediate deputies) together with their personal messages on the occasion of the R.A.F. Display, appear on page 10, introducing a section devoted to the work of the Commands.



The Gloster Meteor 8
powered by
Rolls-Royce Derwent
jet engines
in production
for the
Royal Air Force

ROLLS-ROYCE
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Britain's latest jet fighter

A swept wing interceptor embodying the latest aerodynamic refinements of present day knowledge

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Bristol
forty-years'
contribution
to Britain's
air power . . .
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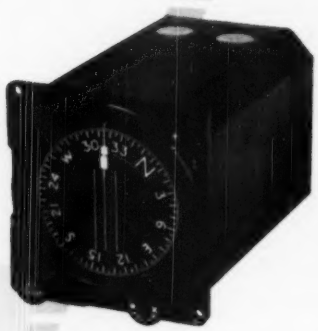
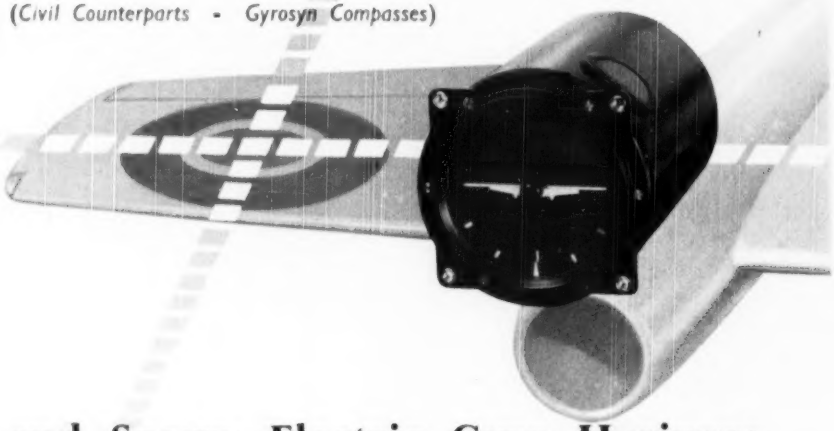
FOR FUTURE GUIDANCE



Sperry Gyro-Magnetic Compasses

(Civil Counterparts - Gyrosyn Compasses)



and Sperry Electric Gyro Horizons have been adopted as standard equipment for the Royal Air Force

SPERRY

Instruments that inspire confidence

SPERRY

THE SPERRY GYROSCOPE CO. LTD., GREAT WEST ROAD, BRENTFORD, MIDDX. PHONE: EALING 6771

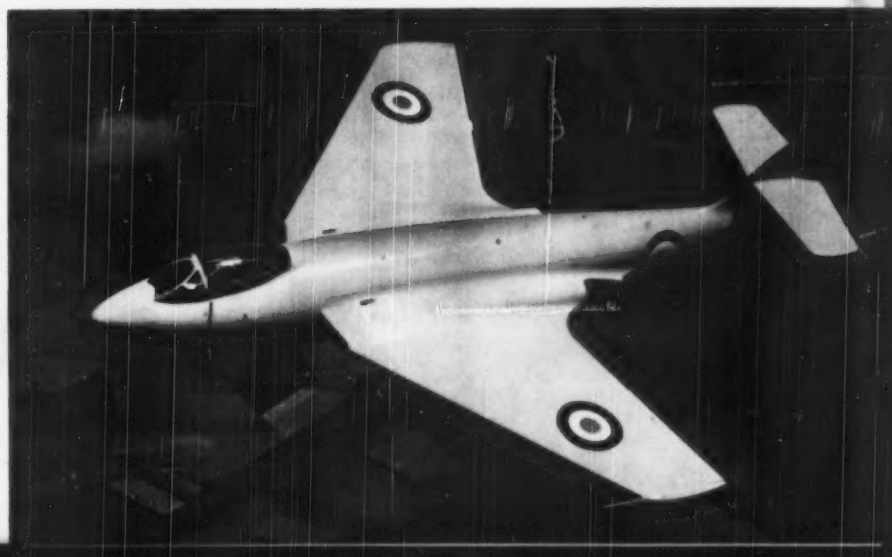
The wing of the de Havilland Venom F.B.1 has a back-swept leading edge and straight trailing edge. The tailplane extends outboard of the twin booms. These characteristics, and the auxiliary tanks at the wing tips, help to distinguish this type from the Vampire.

NEW and EXPERIMENTAL

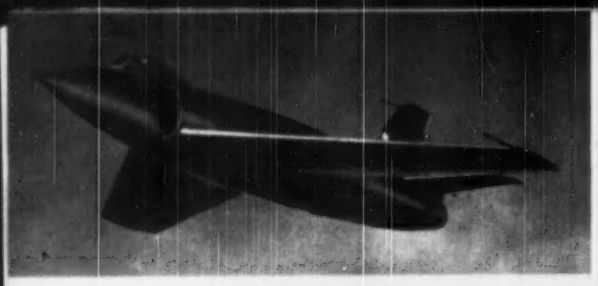
Types of Aircraft Ordered for the Royal Air Force or Now on Test

IN the old Hendon displays the "Parade and Fly-past of New and Experimental Types" was, to the technically minded (and especially the foreign visitors !), one of the most significant events. The machines were prominently exhibited in a specially guarded park, and year by year new types would be released from the secret list for the occasion. It has been decided not to perpetuate this event in the new series of displays (wisely perhaps, having regard to the proximity of the S.B.A.C. Display), though two research aircraft are due to show their paces.

Presented here is *Flight's* "New and Experimental" parade for 1950. Heading this page is the striking silhouette of the de Havilland Venom jet fighter, latest development of the Vampire series and powered with a de Havilland Ghost turbojet. The Venom is especially noted for its high rate of climb and capabilities at extreme altitude, and has the distinction of being the first British fighter to carry auxiliary fuel tanks at its wing tips. The Mosquito-nosed D.H.113 night fighter (left) carries a crew of two. It is the first British jet-propelled night fighter and is in production for overseas air forces. Below is the Hawker P.1052 (Rolls-



The de Havilland 113 Vampire Night Fighter (above) differs from the Vampire single-seaters in the design of its nose, tail and cockpit enclosure. On the right is the experimental Hawker P.1052. Capable of speeds far in excess of 600 m.p.h., a machine of this type has flown from London to Paris in 21 min. 27.8 sec.



The exceptionally fine lines of the Supermarine 510 are admirably brought out in the study on the left. That aerodynamic cleanness is not the prerogative of such small aircraft is proved by the *Flight* photograph of the English Electric Canberra twin-jet bomber, reproduced below. The machine illustrated is the first B.1 prototype.

NEW and EXPERIMENTAL . . .

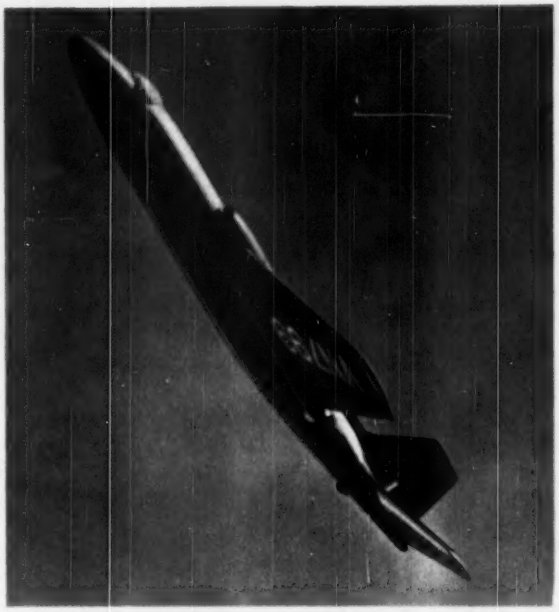
Royce Nene), one of the first British aircraft to have back-swept wings. In its present form, it will not go into production, but is the forerunner of more advanced types.

Rivalling in performance the Hawker P.1052, the Vickers-Supermarine 510, depicted above, has swept-back wing and tail surfaces. It is probably the last jet aircraft to have a tail-down undercarriage. The Rolls-Royce Nene turbo-jet is fed from so-called "elephant ear" intakes flanking the pilot's cockpit, and the jet orifice is in the extreme tail. Like the Hawker machine, the 510 has been built solely for experimental flying and is obviously capable of a great deal of further development.

Since the illustrations on these pages went to press, the existence of the Meteor N.F.11 night-fighter has been revealed. Ordered for the R.A.F., as its first jet night-fighter, this Gloster aircraft is being put into production by Sir W. G. Armstrong-Whitworth Aircraft, Ltd. In addition, reference has been made to the Hawker P.1081.

Ascending sharply, on the right, is the English Electric Canberra, first jet bomber to be built in this country. Powered by two Rolls-Royce Avon axial-flow turbojets, the Canberra is not only fast, but amazingly manoeuvrable; this is largely due to its low wing loading, a factor which is further advantageous in allowing operation at abnormally high altitudes. Although of relatively small dimensions (the span is 64ft), the Canberra has a capacious bomb bay. It carries no armament, but relies for its defence on its speed, agility and operating height. Illustrated is the Canberra B.1; the B.2, as now in production for the R.A.F., is generally similar, but has a transparent nose.

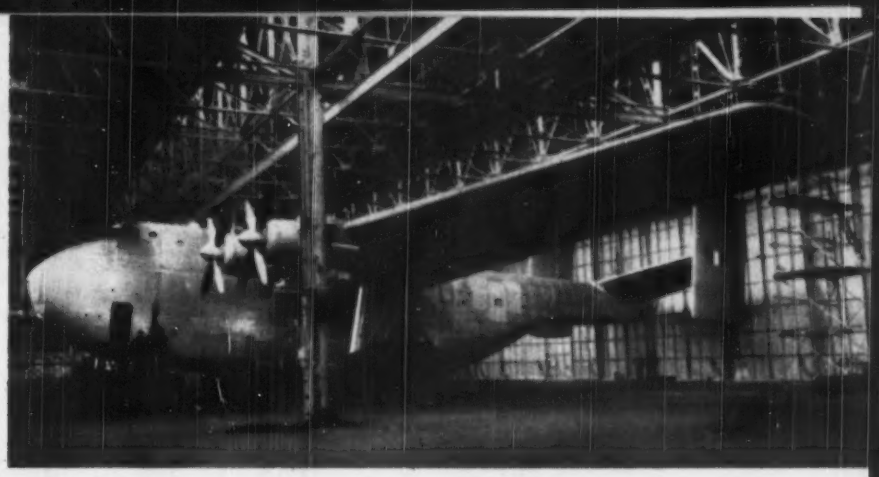
The massive four-engined machine below is the Avro Shackleton G.R.1, now being built in quantity for Coastal Command in replacement of the Lancaster. The engines are Rolls-Royce Griffons, driving de Havilland contra-



rotating airscrews, and the armament, in the present version, is two 20 mm. British Hispano cannon in a Bristol B.17 dorsal turret. The Shackleton is the largest British service aircraft yet adopted, having a span of 120ft.

The largest aircraft designed to operate from small air-

Avro Shackleton G.R.1 general reconnaissance aircraft (four Rolls-Royce Griffons). "Flight" photograph

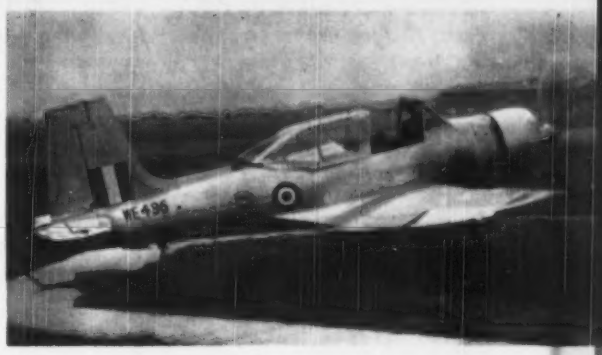


In order to gauge the size of the Blackburn and General Aircraft Universal, it is necessary to compare the height of this, one of the world's largest transport aircraft, with the figure beneath the tail.

fields is the Blackburn and General Aircraft Universal, shown above in the erecting shop. This most promising addition to the range of British transports has four Bristol Hercules engines and is loaded, by means of a ramp, through vast doors at the rear of the freight-hold.

The two small single-engined trainers on this page are the Percival P.56 and Handley Page (Reading) H.P.R.2, both side-by-side two-seaters, powered with the Armstrong Siddeley Cheetah 7-cylinder radial engine, and both designed to meet the latest official requirements.

Flying over the English countryside (below) is the Vickers-Armstrongs Varsity T.1 twin-engined aircrew trainer. This type is Bristol Hercules-powered, and although descended from the Viking transport, now well established in service on civil airlines and in the King's Flight, is thoroughly up-to-date. The undercarriage is of nosewheel type, and the under-slung compartment houses the bombing crew and equipment.

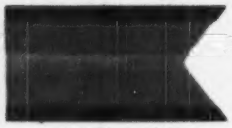


The Handley Page (Reading) H.P.R.2 and Percival P.56 (left) are now on test prior to official evaluation. At the opposite end of the trainer scale is the Vickers-Armstrongs Varsity T.1, shown in flight below. The Varsity is an unusually adaptable aircraft.

Marshal of the R.A.F.

Air Chief Marshal

Air Marshal



Air Commodore

Group Captain

Wing Commander

UNIFORM DISTINCTIONS

Flags, Badges and Insignia of Rank of the R.A.F., R.Aux.A.F. and W.R.A.F.

THE titles and badges of rank of the Royal Air Force were devised and authorized in April, 1918, when the Royal Flying Corps and the Royal Naval Air Service amalgamated to form one independent service.

In the commissioned ranks the broad and narrow rings on the cuffs (and bars on shoulder straps) follow almost exclusively the Naval style, excepting, of course, that the rings are of woven material and not of gold braid.

The coat of arms denoting warrant rank, and the sergeant's stripes, are obvious legacies from the Army. The leading aircraftman's "prop" replaces the army lance corporal's stripe and it is interesting to speculate whether this device will remain when the R.A.F. becomes an all-jet service.

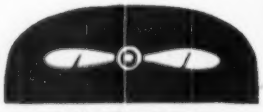
On ceremonial parades a flag denoting the rank of the inspecting officer is worn with the Royal Air Force ensign. In the higher ranks a miniature flag is flown on the radiator of official cars, and on personal aircraft the appropriate flag is painted either on the nose or tail. These flags of rank are of light blue ground with dark blue edges top and bottom. The transverse bars are in red.

Warrant Officer

Flight Sergeant

Sergeant

Drum Major



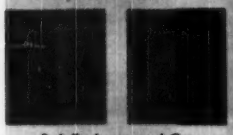
Leading Aircraftman
(W.R.A.F. Ldg. Aircraftwoman)

Corporal

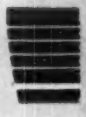
Long-service chevron

Air Vice-Marshal

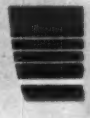
Squadron Leader



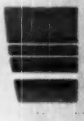
R.A.F. Armoured Car Commander



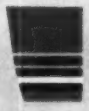
Marshal of the R.A.F.



Air Chief Marshal

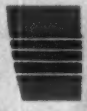


Air Marshal

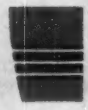


Air Vice-Marshal

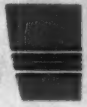
Air Commodore (W.R.A.F. Commandant)



Group Captain (W.R.A.F. Group Officer)



Wing Commander (W.R.A.F. Wing Officer)



Squadron Leader (W.R.A.F. Sqn. Officer)

Flight Lieutenant (W.R.A.F. Flt. Officer)

Flying Officer (now same rank for W.R.A.F.)

Pilot Officer (now same rank for W.R.A.F.)

THE FIRST POST-WAR R.A.F. DISPLAY

Important Messages Addressed to "Flight" Readers

From The Rt. Hon. Arthur Henderson,
K.C., M.P., Secretary of State for Air.

I SHOULD like to extend a most hearty welcome to this special issue of *Flight*, devoted to the work of the Royal Air Force, and timed to coincide with this year's Royal Air Force Display. This issue forms a fitting complement to the Display itself. Throughout the Display the Royal Air Force is on show, but, varied as the programme is, it obviously cannot cover all the activities of the Service. Much must be passed over which is of great importance to the Royal Air Force and of great interest to those who are specially concerned in air affairs. It is this specialized public, from which the readers of *Flight* are drawn, who will, I am sure, wish to learn, in greater detail than is normally possible, of what the Royal Air Force is doing today; of the problems which face us and the ways in which they are being overcome. Much remains to be done, but the R.A.F. faces the future with increasing confidence.

A. Henderson

Mr. Aidan M. Crawley, M.B.E., M.P., Parliamentary Under-Secretary of State for Air.

From Marshal of the Royal Air Force Sir John C. Slessor,
G.C.B., D.S.O., M.C., i.d.c., p.s.a., Chief of the Air Staff.

IT was indeed a happy idea on the part of *Flight* to publish a special number to coincide with the revival of the Royal Air Force Display. The Display was in the past one of the traditional features of the year, and it was a sad day when, a year or so before the last war, circumstances brought about its abandonment. I am delighted that we have been able to revive the event and feel sure that those who make the journey to Farnborough on July 7 and 8—a less easy one, perhaps, than that to Hendon in the past—will, when the Display is over, go away feeling that despite the many and varied difficulties which face us in these times, the standards of the Royal Air Force have been well maintained; and that, although the Service is small compared with what it was five years ago, its spirit is in no way diminished.

J. C. Slessor

Left: Air Chief Marshal the Hon. Sir Ralph A. Cochrane, K.C.B., K.B.E., A.F.C., A.D.C., i.d.c., p.s.a., Vice-Chief of the Air Staff. Right: Air Marshal Sir Arthur P. M. Sanders, K.B.E., C.B., i.d.c., p.s.a., Deputy Chief of the Air Staff.

SOME readers, and especially those who have had long careers in the Flying Services, may feel that this page is incomplete without a message from "Boom" Trenchard—"the father of the Royal Air Force"; but they will find one in the official programme of the Display. Marshal of the Royal Air Force, Lord Trenchard of Wolfeton, G.C.B., G.C.V.O., D.S.O., D.C.L., LL.D., entered the Army in 1893 and learned to fly at the C.F.S. in 1912; thereafter, with progressively increasing responsibility, he did more than any other commander to foster the high tradition and skill of the Service. It is the principles which he established that will largely underlie this week's great demonstration.

UNIFORM DISTINCTIONS . . .

Master Pilot

THE pilot's brevet or wings, shown at the top left, is the most prized of all R.A.F. badges. Only one person, Mr. Winston Churchill, has ever had an honorary award of this badge—His Majesty the King wears his wings as a qualified pilot.

The half-wings shown are awarded to aircrew members other than pilots. Commissioned pilots wear their ordinary badge of rank—rings on the cuffs—and, up to comparatively recently, warrant officers and other ranks wore the coat of arms and N.C.O.'s stripes. The designation of rank of non-commissioned aircrew is now as shown here. It must be remembered, however, that the pilot—of whatever rank—is in charge of an aircraft even though senior officers may be on board.

The badges of rank shown here can apply to any member of an aircrew, e.g., Master Pilot, Navigator I, Engineer IV, etc.

Pilot I

Pilot II

Pilot III

Pilot IV

Cadet Pilot

Insignia of the various specialist branches of the Royal Air Force. Chaplains of all denominations wear the same badge.

Apprentice

Medical

Chaplain

Signals

Education

Physical Training Instructor

Musician

Dental

THE COMMANDS OF THE ROYAL AIR FORCE

Messages to "Flight" Readers from the Air Officers Commanding-in-Chief: The Duties of their Formations

FIGHTER COMMAND

From Air Marshal Sir Basil Embry, K.B.E., C.B., D.S.O., D.F.C., A.F.C., A.O.C.-in-C., Fighter Command

FIGHTER COMMAND was formed on July 14, 1936, for the express purpose of defending the United Kingdom against air attack. The first major battle fought by the Command must have, in part, been witnessed by many of the present-day readers of *Flight*.

It is probably fair to say that in the year 1950 we are too near that event to measure precisely the importance of the victory we won. It is my belief, however, that the historians of the future may well decide that it had a greater impact on the history of this country, and indeed of the civilized world, than did the battles of Trafalgar and Waterloo, because greater issues were at stake.

The achievements of Fighter Command do not, however, derive only from the Battle of Britain, because, being the only Command in the Royal Air Force composed entirely of fighter aircraft, it has always been responsible in some measure for formulating the fighter tactics and doctrines used in other theatres outside the United Kingdom. Moreover, the majority of fighter pilots start their careers on fighter aircraft in Fighter Command, and therefore the Command has always carried a tremendous responsibility for training and the development of that particular fighting spirit so essential to the success of fighter operations. It may be justly claimed, therefore, that the influence of Fighter Command was felt wherever fighter aircraft of the Royal Air Force operated during the war.

We in Fighter Command today are immensely proud of the achievements of the past and the traditions which have been handed on to us, and we are determined to guard them jealously and, like the wise servant in the New Testament, increase our heritage tenfold.

This heritage carries with it great responsibility—responsibility, in the event of war, for the air defence of the United Kingdom and of the sea lanes round our coasts. It must be clear to all that the greatly increased destructive power of modern weapons makes efficient air defence a vital issue. Indeed, is it not right to say that our survival in any future war will depend on our ability to defend ourselves adequately from air attack?

Today, in Fighter Command, our efforts in the air and on the ground are directed towards that aim. We are training by day and by night, in good weather and bad; we are learning to shoot, we are preparing to play our part should the need arise. If, therefore—and here I speak to the general public rather than to the readers of an aviation journal—at times we disturb your peace by our noise or cause you inconvenience, I am sorry, but I should like you to know the reason why, and I ask for your support as your share towards air defence.

B E Embry

THE role of Fighter Command is concisely described in the motto which forms part of its recently introduced badge—"Offence Defence." The heraldic description of the badge is, "In front of a portcullis a sword erect." The sword indicates the Command's offensive operations, while the portcullis symbolises its defensive role.

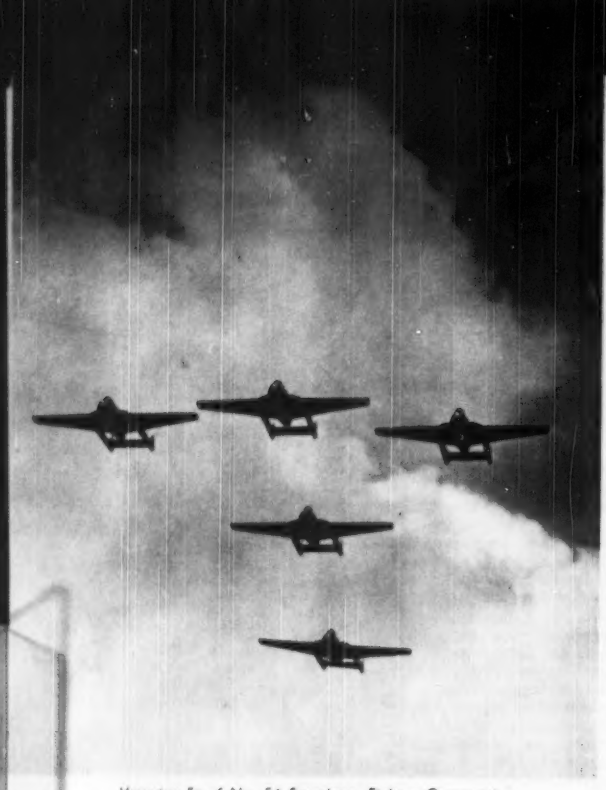
The Command's primary task today is the same as it was on its formation in 1936, namely, the defence of the United Kingdom against air attack. It is, therefore, responsible for the operational control of all components of the country's active air defences. In addition to the regular fighter squadrons, it controls the Royal Auxiliary Air Force fighter squadrons, the Royal Observer Corps and the radar network around the British coastline. It is also responsible for the operational control of the guns of Anti-Aircraft Command.

The air defence of a highly industrialized and thickly populated country such as the United Kingdom is an extremely complicated affair which does not merely depend on having an unlimited number of high-performance fighter aircraft or anti-aircraft guns. There must also be an effective warning system so that the fighters will be in the right place at the right time, and the anti-aircraft guns alerted, as well as a system to sort out the warning reports and decide which raid or raids constitute a serious threat. Another requirement is the closest possible understanding with the anti-aircraft guns, to ensure that they do not engage our own aircraft or enemy aircraft which are being dealt with by our own fighters. In brief, there must be a fully integrated system for controlling the movements of the fighters and passing on all relevant information about enemy aircraft.

It can thus be seen that there is a great deal of procedure and organization behind an effective air defence system. In view of the ever-increasing performance of modern aircraft, it is vitally important that the system shall be maintained at the highest standard of operation and efficiency that can be achieved, and shall constantly be kept up to date.

At the present time, Fighter Command contains two groups—No. 11 (commanded by Air Vice-Marshal T. G. Pike, C.B., C.B.E., D.F.C.), which controls units in the southern half of England, and No. 12 (commanded by Air Vice-Marshal G. Harcourt-Smith, C.B., C.B.E., M.V.O.), which controls units in the north and Northern Ireland, the groups being sub-divided into sectors.

Owing to the rapid increase in bomber performance, and the consequent need for ever more speed in dealing with all matters regarding their interception before they reach their target areas, the fighter sectors are tending to become the key formations within the Command. Each sector has, in



Vampire 5s of No. 54 Squadron, Fighter Command.

FIGHTER COMMAND . . .

addition to its regular airfields and squadrons, a certain number of R.Aux.A.F. fighter squadrons, radar stations and R.O.C. posts and operations rooms.

As regards its present first-line fighting aircraft, Fighter Command is unique among the operational Commands of the R.A.F. in having had its regular squadrons completely re-equipped since the war. In the Meteor, Vampire and Hornet, the R.A.F. possesses practical fighting aircraft as modern and efficient as those in the service of any other power. But this should not be taken to suggest that there is any feeling of complacency regarding Britain's fighting aircraft.

The Venom, which is to replace the Vampire, has a performance which exceeds that of the Vampire in all respects, and is due to start coming into squadron service next year. It will have the dual role of interceptor and fighter-bomber. The latest version of the Meteor, which has a better performance than the Mk. 4 in several important respects, should be in squadron service this summer.

Details of the new types under development are inevitably restricted at this stage, but it can be said that the fighters will be of considerably more advanced design than those now about to go into service, with speeds well over 600 m.p.h., and capable of operating at great heights.

For the night fighter force, a twin-jet two-seater is now in production and it is planned to re-equip a substantial number of the Mosquito squadrons during 1951. This aircraft, the Meteor N.F.11, has been ordered in sufficient quantity to expand the night fighter force beyond its present size as well as re-equipping all the Mosquito squadrons. Carrying full radar equipment, the new night fighter will also have an all-weather role for operating in conditions which would normally ground the day fighters. The change-over to jet night fighters is not expected to give rise to any major problems, but the more critical endurance of the jet aircraft will necessitate meticulous attention to such matters as aircraft control procedure and landing techniques at the airfields.

The plan for the 20 R.Aux.A.F. fighter squadrons, which were transferred to Fighter Command last November, is that they will all have jet aircraft by the end of 1951. At present, nine of the squadrons have either Meteors or Vampires, and eight more will be similarly re-equipped by next spring. As the regular squadrons receive their new Meteors and Venoms, more Meteor 4s and Vampires will become available for the Auxiliaries.

In several instances there are difficulties to be overcome in connection with the development of airfields on which Auxiliary squadrons are based—development to standards suitable for the operation of jet aircraft—and it may be that one or two of the squadrons will have to operate from bases at some distance from the city or town with which they have for many years been linked.

Since the transfer of the Auxiliary squadrons from Reserve Command to Fighter Command, much thought has been devoted to the question of their adequate training so that they may be capable, at short notice, of becoming an integral part of Britain's front-line air defences. A great deal has already been achieved in a short time by affiliating the Auxiliary squadrons to appropriate regular squadrons, so that the week-end fliers can have frequent opportunities to keep abreast of modern techniques and developments. The regular squadrons have entered into the spirit of this scheme with great enthusiasm, despite the additional work which it inevitably places on their stations at the weekends.

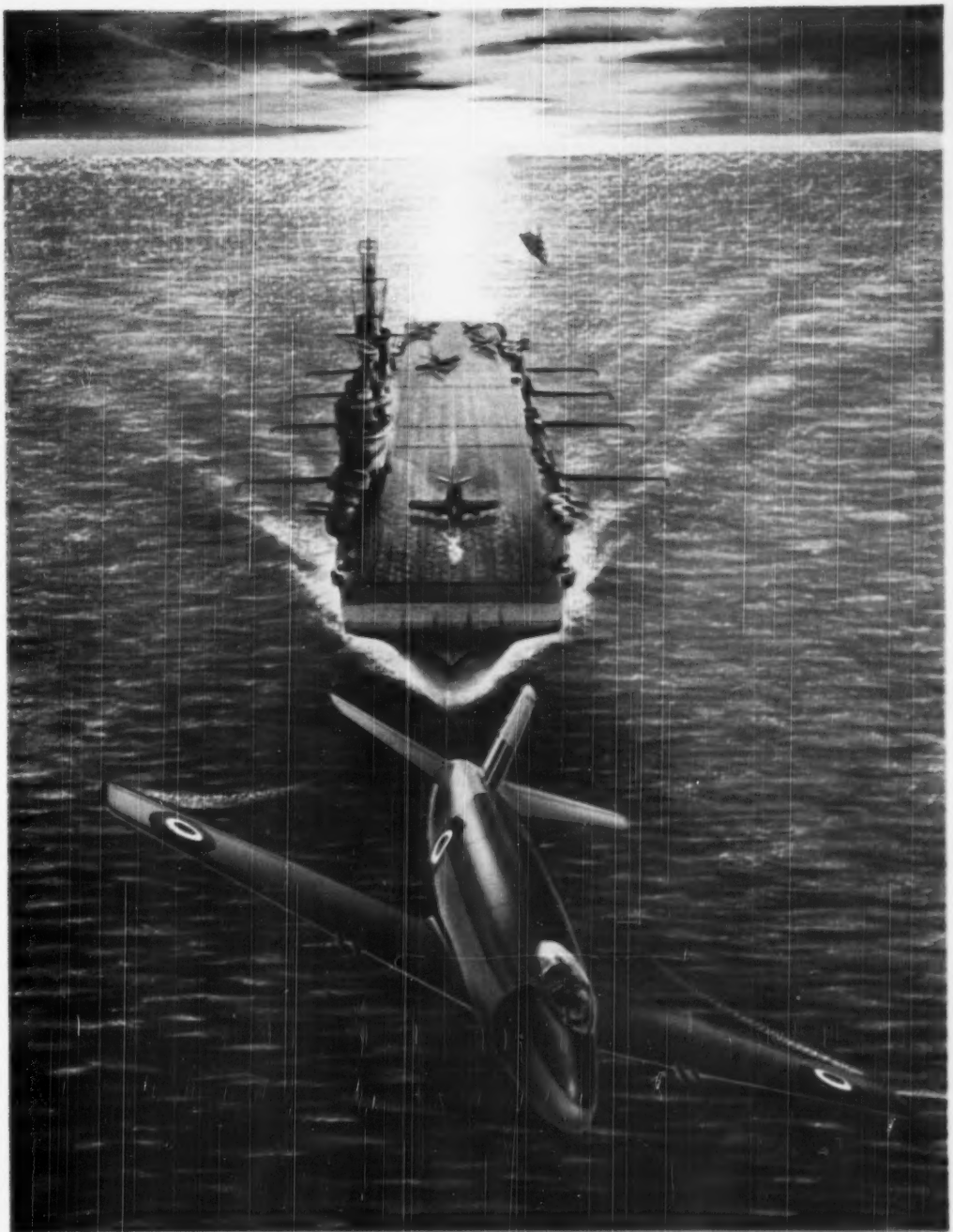
The broad aim of Fighter Command is to build up a balanced fighter force, keeping pace with progressive advances in the technique of air warfare. Side by side with the development of new aircraft goes the development of new weapons and ground equipment, but the same security considerations prohibit the publication of detailed information about progress in this field. As regards weapons, a likely trend is towards higher rates of fire and larger calibres as a first step, with rockets and guided missiles as subsequent developments. It will be recalled that the Secretary of State for Air, in his Air Estimates speech last March, said that work is now being done on an advanced air-to-air guided missile, designed to improve the effectiveness of our fighters against the modern bomber.

On the ground side, there is an extensive programme for modernizing and extending the control and reporting system, including not only the radar stations themselves, but also the communications network and control centres behind them. The new radar equipment will be not only more efficient, but simpler to operate and to maintain than the present apparatus.

In Fighter Command's constant development work, the unit which has perhaps the biggest responsibility in ensuring that operational methods are always up to date is the Central Fighter Establishment. This may be described as the Command's research unit for carrying out the various studies of fighter operations. One of its main aims is to visualize as far ahead as is possible the likely trends of future air attack and the defences against them. It is also charged with the task of devising means for increasing the tactical efficiency of fighter aircraft in all offensive and defensive roles which they are likely to be called upon to undertake.

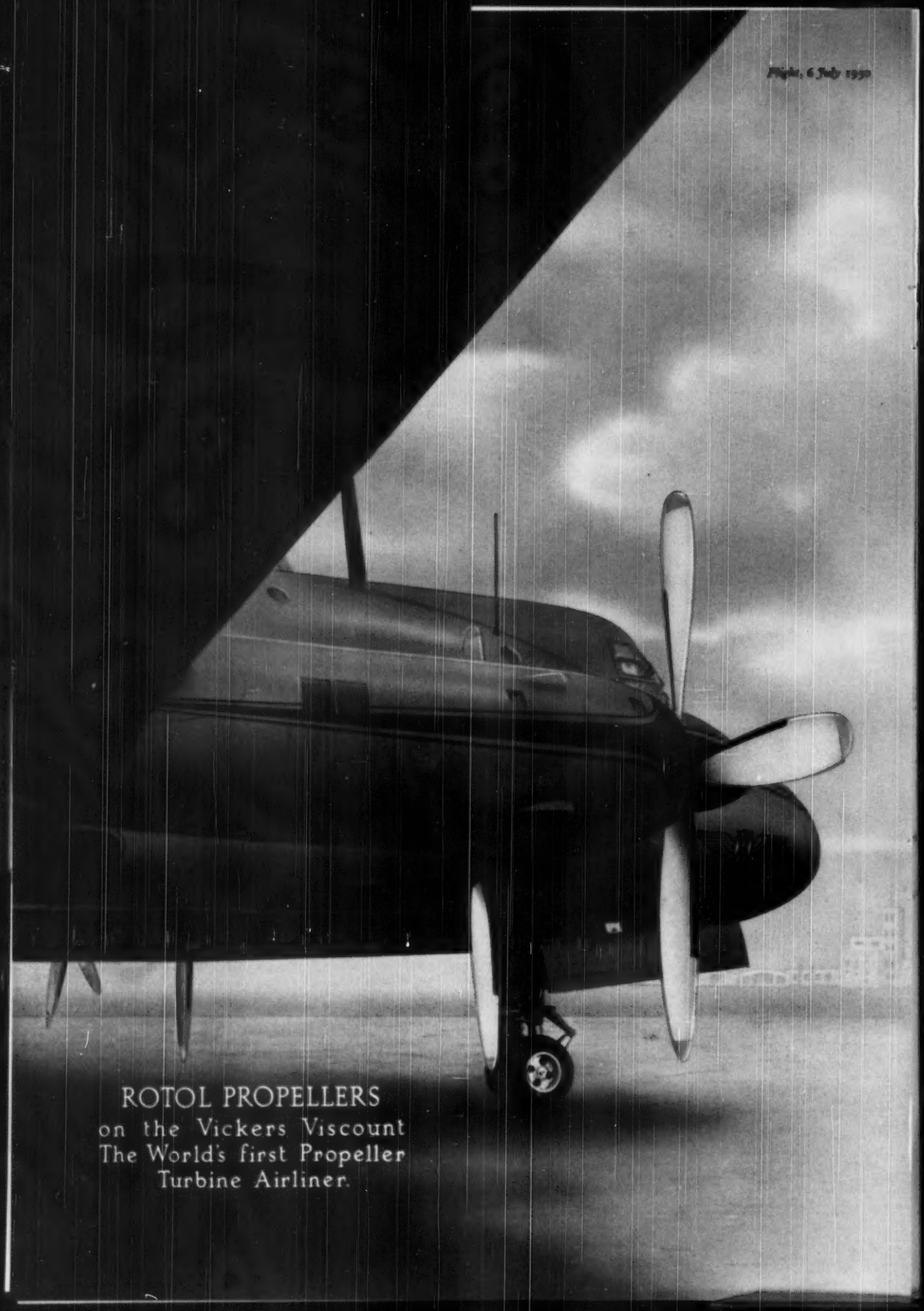
Efficient aircraft and equipment are of little value without a sound training policy. As the culmination of the annual squadron training, Fighter Command each year takes part in at least one major air defence exercise. This was the regular practice before the war, and was revived in 1948 with Exercise *Dagger*. In 1949, the exercise was divided into two distinct sections—*Foil*, with a fighter bias, and *Bulldog*, with a bomber bias. This year there will again be one main exercise. These events may be regarded as an annual stocktaking, from which the past year's progress may be assessed, and which also provide indications as to the lines along which the next year's training should be directed. Such exercises are essential if Britain's air defence measures are to progress. Apart from their value to the regular element of Fighter Command, they are also of incalculable benefit to the vital non-regular elements—the R.O.C., the Auxiliary fighter squadrons and F.C.U.s and to the Territorial units of A.A. Command. Apart from these annual air exercises there are others of a minor character throughout the year, which may be to test particular sections of the air defences or to try out new equipment or techniques.

The history of Fighter Command is familiar to *Flight* readers, and it is not necessary to give more than a very



'ATTACKER' The Vickers Supermarine 'Attacker', powered by a Rolls-Royce Nene engine, is now in production as the latest carrier-based jet fighter aircraft for the Royal Navy.

VICKERS-ARMSTRONGS LTD. AIRCRAFT DIVISION, WEYBRIDGE & SUPERMARINE WORKS



ROTOL PROPELLERS
on the Vickers Viscount
The World's first Propeller
Turbine Airliner.

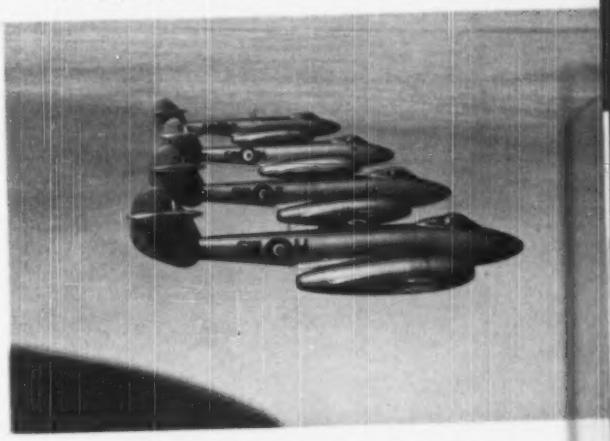
These Fighter Command aircraft seen at exercise are two Hornet fighter-intruders and (below) four Meteor intercepters.

FIGHTER COMMAND . . .

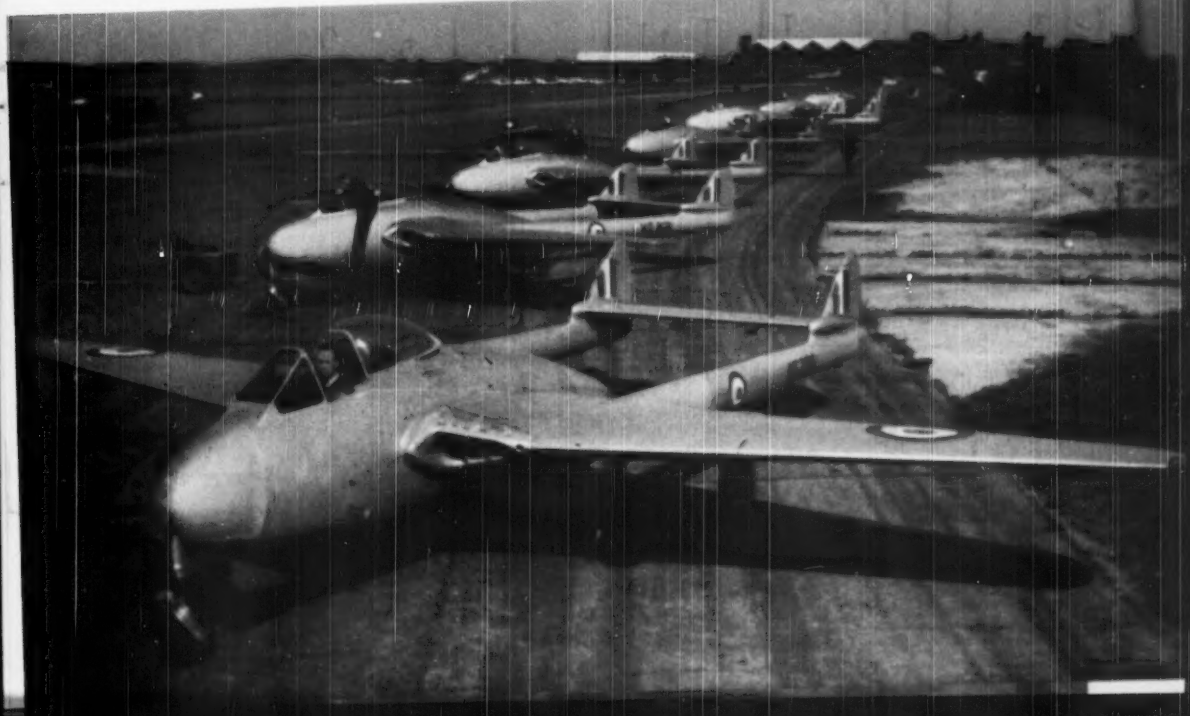
This supplement is illustrated by a series of "Flight" colour photographs taken specially for the occasion.

brief review. Headquarters have remained at Bentley Priory, Stanmore, since the formation of the Command. For a period of eleven months, in 1943-44, it reverted to its old title of Air Defence of Great Britain.

At the outbreak of war in 1939, there were three groups (Nos. 11, 12 and 13) and 39 operational squadrons, regular and auxiliary. Seventeen squadrons had Hurricanes, 10 Spitfires, 6 Blenheims, 4 Gladiators, 1 Gauntlets and 1 Hinds. At the start of the Battle of Britain, the Command had expanded to 52 squadrons, comprising some 1,000 serviceable aircraft. The German squadrons involved in the battle had, altogether, some 2,700 aircraft. German losses during the period July 10, 1940-October 31, 1940, were 1,733 aircraft destroyed and 643 damaged. Fighter Command lost 449 pilots and air crew. By January, 1943, it had increased to 104 squadrons, but from that date it decreased as the 2nd Tactical Air Force was built up. Among the Command's many and varied tasks were the operations in France in 1939-40, the heroic Norwegian episode of 1940, when a handful of Gladiators based on a frozen lake fought against overwhelming odds, cover for the Dunkirk evacuation, close cover and support for the Dieppe raid of 1942, bomber escort and offensive strikes over the Continent, intruder and bomber-support operations, the shooting down of more than 1,800 flying bombs, and attacks on rocket sites and storage sites.



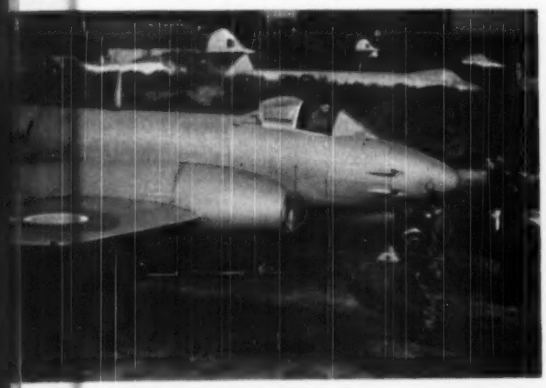
(Below) "Week-end" units of the R.Aux.A.F. supplement the regular forces; Auxiliary D.H. Vampire 3s are shown at North Weald.



FIGHTER COMMAND . . .

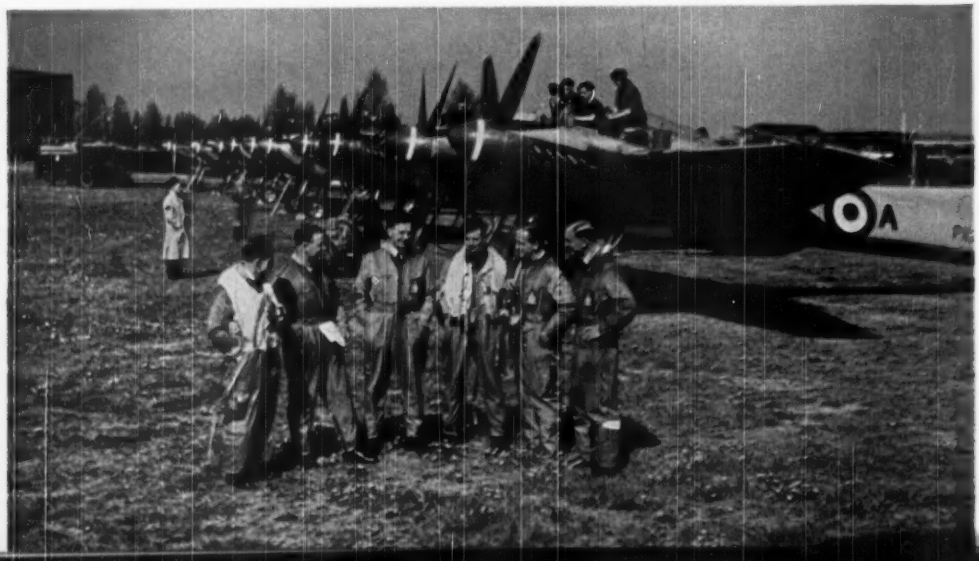
Close formation-flying by pilots of No. 43 Squadron, Fighter Command, made possible this striking study of Gloster Meteor 4s.

Servicing completed, ground crews prepare to run up the Rolls-Royce Derwent turbojets of a Meteor 4 in its blast-bay at Tangmere.



Re-arming the four 20-mm guns of a de Havilland Hornet 3, one of the few airscrew-driven fighter-types still in regular service.

Pictured below at R.A.F. station Church Fenton are men and machines of a typical Hornet squadron of Fighter Command.



BOMBER COMMAND

From Air Marshal Sir Hugh P. Lloyd, KBE, CB, MC, DFC

Air Officer Commanding-in-Chief

Hugh Lloyd

"STRIKE Hard—Strike Sure" is our motto. During the war this Command lived up to every word of it.

For two whole years Bomber Command, and Bomber Command alone, took the war not only to the enemy but to the very heart of his homeland. We recall the very great part played by the Command in the Battle of Britain, against enemy airfields at night and against the barges. We also recall the destruction of the enemy war industry in the Battles of the Ruhr, Cologne, Hamburg, Berlin, etc.; the Transportation and the Oil Battles as well as the Battle over the Sea, without which the invasion of Normandy would have been an impossibility. Perhaps the invasion would have been earlier and the war shortened had Bomber Command been as strong in 1939 as it was in 1943.

Nor do we forget that every section of the flying-bomb research establishment on the Baltic Coast was seriously damaged as early as August 17th-18th, 1943, or that in the December all of the 64 permanent launching sites on the Continent (which had been built deep in the ground at very great cost and over so long a period) were completely destroyed. This gave us six months' respite from attack. And more than that—the German plan, which was to launch 6,000 bombs each day, achieved only 95 a day from the temporary and poorly constructed launching sites. Of those only 66 per cent reached this country.

With the advent of air power as the dominant factor in war, its effect can be felt immediately by the people. We, as a nation, refrain from striking the first blow. Hence it is vital that we should be capable of immediate reprisal—a reprisal so devastating in its results as to deter any enemy. But in the launching of it time is no longer our ally: there must be instant action, like that of a fire brigade.

Bomber Command appreciates that its responsibilities to-day and in the future may well be even greater than during the war. It is proud to carry them.

"Strike Hard—Strike Sure"—and on the instant.

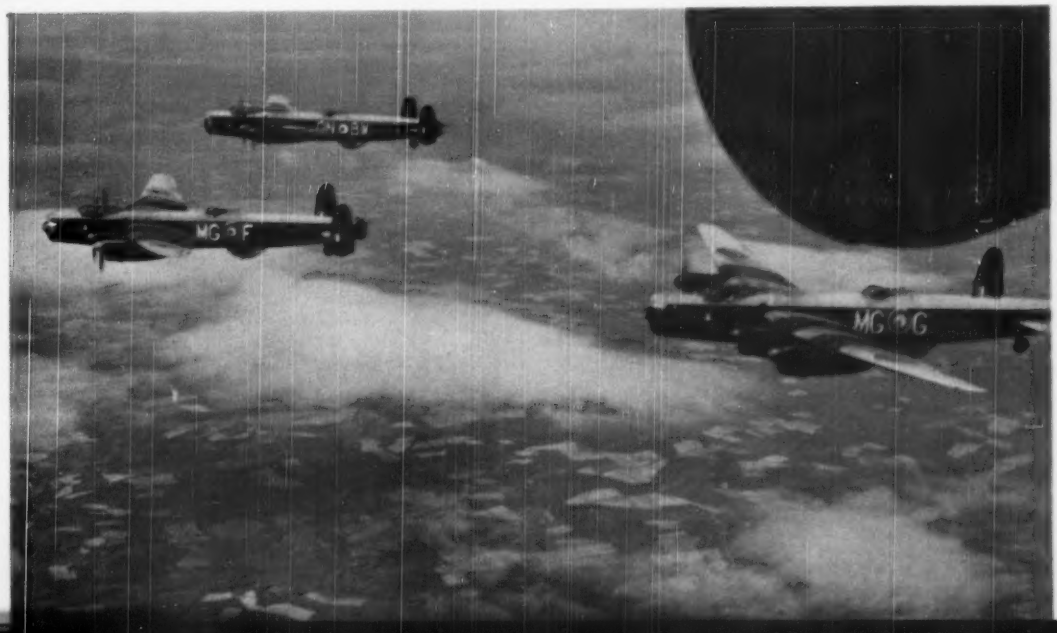
AS long ago as 1947 the Minister of Defence stated that the second priority for Imperial security was "to maintain the structure of the Royal Air Force and its initial striking power." The perfect example of an initial striking power is Bomber Command, and this very heavy and vitally important responsibility is one which the Command is proud to shoulder.

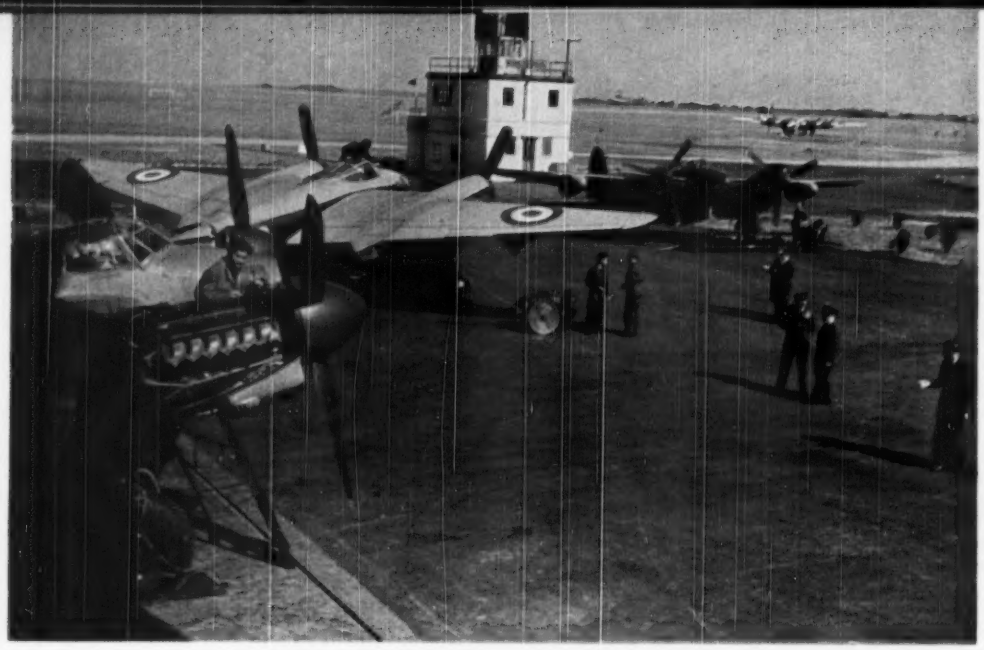
Bomber Command has the most complicated and intricate task in any military flying activity—to find, bomb and destroy an objective despite enemy opposition and in all weathers. Not only is the most expensive and delicate equipment required to find and hit a small target in such circumstances and from a great altitude, but the highest degree of skill is required—both from individual members of the flying crew and the crew as a team—to put the bomb on the target. To achieve this objective, closest co-operation and understanding between all members of the crew is essential to the success of every mission.

To fulfil its vital task Bomber Command not only requires experience and quality in its flying crews, but the highest skill and integrity in the personnel who maintain each heavy bomber and its complex equipment. Without the highest standard of maintenance, the flying crews, no matter how excellent, could accomplish little. The whole of Bomber Command, from air marshal to aircraftman, is one team with one aim—to put the bomb on the target; in other words, the sole criterion of efficiency is bombing accuracy.

The Command of today may lack numerical strength, but it does not lack quality, skill or enthusiasm. Its mem-

Two Bomber Command Lincoln squadrons are represented in this stately formation, photographed over the West Country.





In this pleasing scene are Mosquitoes of Bomber Command's Marker Force, undergoing first-line servicing on an airfield in Lincolnshire.

BOMBER COMMAND . . .

bers intend to live up to their motto—"Strike hard, strike sure"—as did their predecessors during the war. They realize that the best contribution to lasting peace they can make as individuals is to be highly efficient and fully prepared, for they recognize that the very existence of a powerful retaliatory striking force is one of the strongest deterrents to a potential aggressor.

The Command has two Groups, No. 1, with headquarters at Bawtry, and No. 3, with headquarters at Mildenhall. At the moment it is principally equipped with its standard bomber, the faithful Lincoln, and also has Mosquito squadrons to undertake special marker duties. Normal operational conversion, and training for duties with the B-29s acquired from America, are also undertaken by units within the Groups. The work of the Central Bomber Establishment, recently disbanded, has now been allocated to squadrons of the Command.

The squadrons are to be re-equipped with Canberras and B-29s pending the introduction of a standard four-engined jet bomber which it is hoped will have a radius of action of 2,000 miles and be capable of operating at something like twice the height and speed of the Lincoln.

The Canberra (two Rolls Royce Avons) has already shown itself to be a first-class aircraft and squadrons should be equipped with this type next year. Variants could—and almost certainly will—be produced for a number of other roles, i.e., target marker, tactical bomber and, possibly, intruder.

There are many problems, in peace as in war, associated with improving bombing accuracy and techniques by developing equipment, training and organization. Modern types of aircraft already fly at much greater speed, greater heights and over far greater distances than those used during the war, and all these factors increase the difficulties of finding and hitting the target. Future development is tending towards some form of automatic navigation and bombing aids. The aim is to halve bombing error and, by so doing, to increase the striking power of the Command, perhaps as much as fourfold; this will result in fewer casualties and less effort and, because one attack will suffice in place of four, the strain on the nation's resources will be reduced in proportion.

Great emphasis is being placed on the training of flying crews and at least equal emphasis upon the training of personnel who maintain the aircraft; their importance is, in fact, increasing every day in readiness for the approaching new era in which will be demanded all the skill and imagination of the country. Extremely expensive and complex modern aircraft will require the most highly qualified from among the nation's youth to operate them to the full advantage.

The B-29s being delivered under the Mutual Defence Assistance Programme will in this interim period raise considerably the current fighting efficiency of the Command. The U.S.A.F. are training R.A.F. crews and ground staff in the handling of the aircraft and, for the time being, are also helping in the major maintenance and overhaul.

The following account indicates the type of realistic training exercise undertaken at regular intervals by squadrons of Bomber Command, flying for the most part in Lin-

A No. 7 Squadron Lincoln receives attention from its ground crew.

"Behind-the-scenes" impression from the bomb dump at Upwood.

colns fitted with four Rolls-Royce Merlin 68 engines.

Exercise *Sunray* is an intensive monthly flying programme for Bomber squadrons, and it has been centred on the Middle East since its inauguration in the summer of 1947. All Bomber squadrons have carried out one *Sunray*, and most of them two. During the summer months a detachment from one squadron at a time goes on the exercise; in winter time, with poor flying weather at home, detachments from two squadrons, plus three marker Mosquitoes, take part at a time. The Mosquitoes fly out independently, joining in the exercise in the Middle East. Transport Command supply transport aircraft for ground personnel, equipment, kit, etc. In the next winter (December) exercise, there will be four Hastings, four Dakotas, and one York, carrying 140 personnel and 12,000 lb of kit, in addition to spares. Squadrons participate in their entirety.

On the way out, Filfa Island near Malta is bombed and Malta-based fighters attempt interception. Any British vessels at sea at the time are simulation-bombed and the detachment is required to put a fully combatant force in the air within a few hours of arrival at Shallufa.

Bombing, fighter affiliation, and air-to-ground firing by day and night, and air-to-air firing by day, are all included in the month's training programme. The first fortnight of the course is confined exclusively to local operations. From Shallufa, individual raids are made with live practice bombs on a range in the desert six miles away, when air gunners come into their own, strafing ground targets and firing at towed drogues. Night flying, too, is an integral feature of the first half of the exercise.

A long-distance bombing raid on a range near Habbaniya coincides with the half-way point on the training schedule. The target is pinpointed and straddled with practice bombs.

The culminating operation and the highlight of the exercise is the bombing sortie to Khartoum in the third week. A strong element of operational realism is introduced into this 1,100-mile practice mission. Precisely the same tactics are adopted as if the bomber force had been briefed to attack real military objectives.

During the closing stages of the exercise, sorties are made against Cyprus and buildings on the R.A.F. Station at Nicosia are "bombed" photographically. Vampires attempt interception. The flight home is conducted as a long-distance navigational exercise.

Pre-take-off check of the load—Target Indicators or bombs—to be carried by a Marker Force Mosquito.

Members of a Lincoln crew board their aircraft at dispersal.

COASTAL COMMAND

From Air Marshal C. R. Steele, C.B., D.F.C., Air Officer Commanding-in-Chief

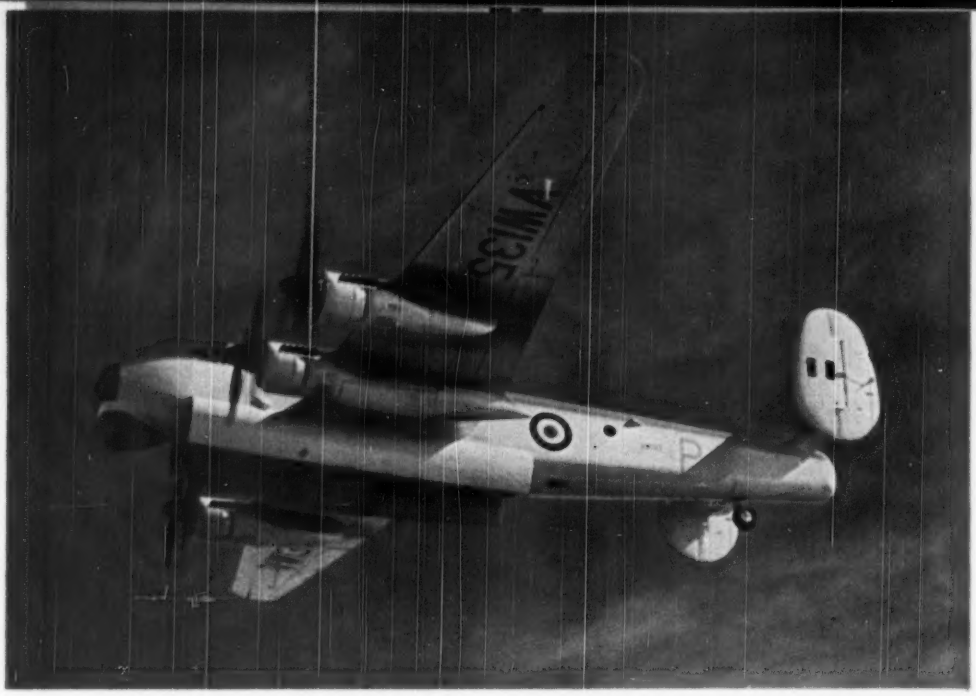
I WONDER how many of the general public realize the importance of Coastal Command and just what part its aircraft play in the defence of this country. The names of Fighter and Bomber Command are self-explanatory, but "Coastal" in no way explains the activities of my Command. In simple language, Coastal Command, in conjunction with the Royal Navy, is responsible for our trade protection. On this task, its aircraft range far out to sea (1,000 miles or so) as well as operating over coastal waters.

This country came within an ace of defeat in our last two wars because of the grievous losses caused by enemy submarines to our merchant shipping and vital supplies. Admiral Doenitz said in 1940, "I will show that the U-boat alone can win the war; nothing is impossible to us!" He was nearly right. Had the Battle of the Atlantic been lost, our fighting forces would have been immobilized through lack of fuel, we should have starved, and we should undoubtedly have lost the war.

In the event, the battle was won and the major contribution to our victory was made by anti-submarine aircraft, operating over an area of some ten million square miles, which destroyed over 50 per cent of all the U-boats sunk at sea. Hence, to-day, the protection of our trade has become a joint responsibility of navies and air forces working as one—air power and sea power indivisible.

When Germany collapsed, a new and more deadly U-boat fleet was nearly ready for sea. Its submarines were equipped with schnorkels and new forms of underwater propulsion and would have been far more difficult to detect and kill than were the submarines which fought the Battle of the Atlantic. In a future war we should have to contend with even more advanced and dangerous craft. Navies alone cannot undertake this task; Coastal Command's shore-based aircraft must be available in sufficient numbers to play their vital part in protecting our trade.

C. R. Steele air mshl



The latest reconnaissance aircraft for Coastal Command is the well-equipped Avro Shackleton, here revealing its capacious bomb-bay

COASTAL COMMAND . . .

COASTAL COMMAND consists of a number of reconnaissance and anti-submarine units with appropriate development formations, schools and marine craft units. It is organized in two Groups, with Headquarters in Scotland and on the South Coast respectively. Since the aircraft of this Command work in close co-operation with Naval vessels in the detection and destruction of submarines the Group Headquarters are integrated with their Naval counterparts.

The strategical and tactical functions of Coastal Command are:—

(a) *Trade Protection*, including: (i) Close and distant escort to convoys; (ii) Offensive anti-submarine patrols either in the enemy patrol area or to prevent boats leaving port or entering their patrol area; (iii) Hunter-killer operations with surface escort groups.

(b) *Fleet Protection*.—Anti-submarine escort to Naval vessels.

(c) *Fleet Reconnaissance*, including reconnaissance of enemy ports and the tracking and shadowing of enemy ships at sea.

(d) *Meteorological Reconnaissance*, including routine daily met. sorties and special sorties to help in preparing specific forecasts.

(e) *Search and Rescue*, including: (i) Air search over land or sea for missing personnel; (ii) Rescue by short-range marine craft; (iii) Rescue by dropping survival gear or airborne lifeboats; (iv) Mountain rescue operations.

The primary role of Coastal Command is anti-submarine warfare; subsidiary roles are meteorological reconnaissance and search and rescue. The outstanding success of our anti-submarine aircraft during the Battle of the Atlantic was largely due to the submarines' need to surface to charge their batteries and the ability of radar to detect a surfaced U-boat. Modern submarines are equipped with schnorkels and other devices which enable them to remain below the surface. Their under-water speed is much higher than that of the last war type of U-boat; therefore the main problem facing Coastal Command to-day is that of detecting, locating and destroying submerged submarines. The solution lies in special equipment, large crews and superlative training, all of which are expensive.

Another wartime problem is that our mercantile trade is spread over the whole world and would therefore offer a world-wide target to enemy submarine attacks. Although such attacks would be most deadly in the focal areas, long-range submarines can concentrate their attacks anywhere in the oceans at short notice. It therefore goes without saying that the Command must be capable of meeting a threat in any area, and this in turn demands very-long-range aircraft and high strategic mobility. Long-range landplanes are mainly used for anti-submarine and reconnaissance operations, but since these aircraft

Atlantic-bound, a Short Sunderland of No. 201 Squadron passes over Skomer Island, off the coast of Wales.

require large airfields which are not always available part of the force is equipped with flying boats.

A large force cannot be afforded in peacetime, so it is essential that the squadrons available are fully trained. Anti-submarine training requires many hours of flying practice and frequent exercises with submarines and escort vessels at sea. The thousand and one other commitments of both the Navy and the Air Force, e.g., in connection with search and rescue, make adequate training difficult. However, it is essential that Coastal Command should be sufficiently strong and well trained in peacetime to withstand the initial onslaught from enemy submarines.

The requirement for a means of detecting and killing submarines under water is bound to lead to more complicated equipment and weapons and, consequently, larger aircraft. If this process goes much farther the aircraft will become so expensive that it will be uneconomical to use them for short-range patrols. It may then become necessary to provide a short-range aircraft for inshore operations. Although the Battle of the Atlantic was fought far out over the ocean, it is possible that, against the new type of submarine, future battles may be fought close to our coasts.

As submarines spend less time on the surface, sightings are bound to become fewer. To keep the rate of kills up to that of the last war the ratio of kills per sighting must be improved until "a sinking every time" is achieved. This will require improved weapons, still closer co-operation with Naval hunting groups, intensified training and provision of the most effective detection apparatus and weapons.

At present the Command is equipped with Lancasters, Sunderlands and Halifaxes. It is expected that this year the Lancasters will be replaced by Shackletons and the Halifaxes by Hastings. A new flying-boat design is under consideration.

All the maritime reconnaissance aircraft in Coastal Command are equipped with radar, and all anti-submarine aircraft are equipped to carry sonobuoys. Sonobuoys are small hydrophones which can be dropped by aircraft and whose "contacts" can be heard by the aircraft crew, so that they can follow a submarine's course under water.

Maritime reconnaissance squadrons are also trained and equipped to carry and drop airborne lifeboats. The airborne lifeboat is a 30ft craft which is carried below the aircraft fuselage to be dropped by parachute to distressed crews in the water. It has sails and a small engine which gives a maximum speed of seven knots and a range of 600 miles at four knots. The boat is provided with food, water and protective clothing to enable ten men to remain safely at sea for five or six days. All maritime aircraft can also carry and drop the Lindholme gear, which consists of a rubber dinghy and four supply containers holding food and survival equipment.

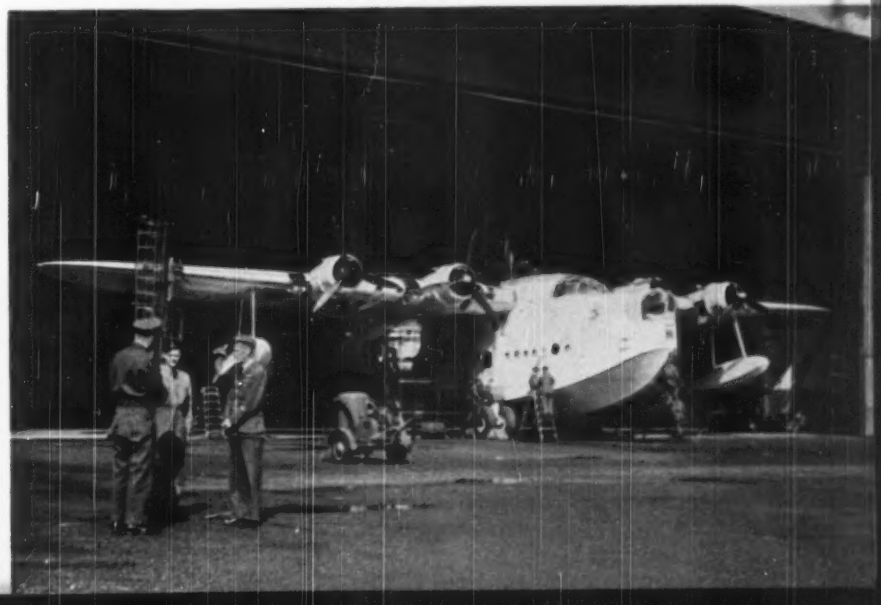
Servicing of marine equipment at Pembroke Dock—a Sunderland base

Because of the very specialized equipment used by aircraft in anti-submarine warfare, Coastal Command is absolutely dependent on highly skilled tradesmen. The training of these men is a specialized and lengthy business and it is not possible to train or employ National Service airmen in the work. There are not enough regular airmen to go round and the shortage seriously affects training.

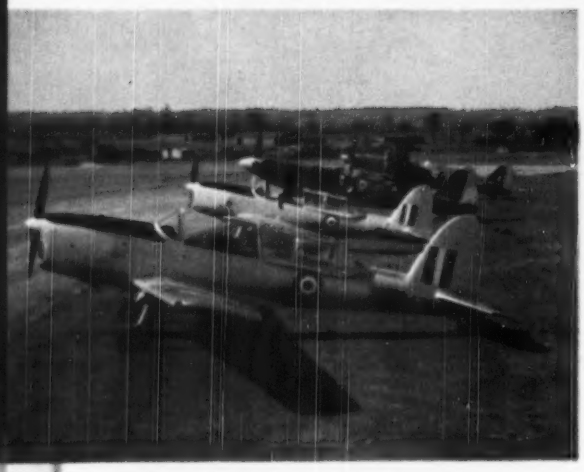
The need for large crews raises another manning problem. Every long range anti-submarine aircraft requires at least two pilots, a navigator, two engineers and two signallers, as well as gunners, and this number is likely to increase as more complicated weapons come into service. In these days of full employment it is not easy to attract the very high standard of recruit required for such jobs.

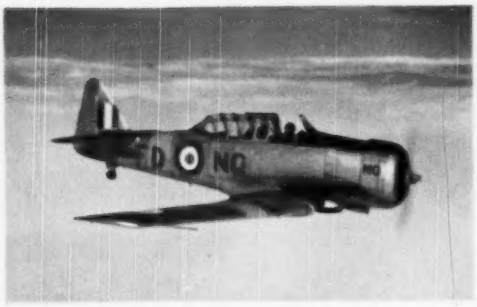
Coastal Command is responsible for the control and co-ordination of search and rescue within the United Kingdom and surrounding waters. No aircraft or marine craft are maintained specifically for such duties, but maritime aircraft and others are available at all times in emergency. Coastal Command stations keep search aircraft equipped with dropable survival gear at immediate readiness, and aircraft with airborne lifeboats are available at short notice in England and Scotland. Marine craft units around the coast and mountain-rescue units inland stand by for emergencies.

All rescue operations are controlled through rescue co-ordination centres, which are located at Rosyth, Plymouth and Aldergrove in Northern Ireland. All distress messages and calls for help are channelled into the R.C.Cs., where the duty controller can despatch search aircraft, airborne lifeboats, marine craft or mountain rescue teams as necessary.



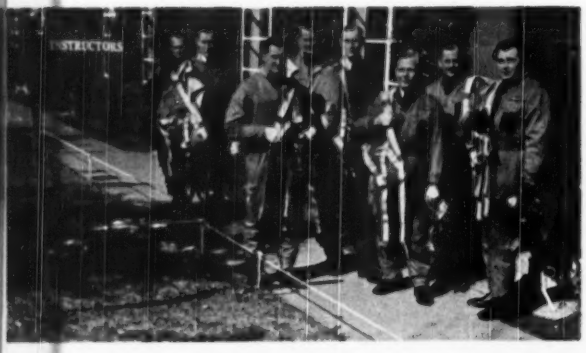
Sunderlands—one of which is seen under inspection at Pembroke Dock—and Lancasters are at present used by Coastal Command reconnaissance squadrons.



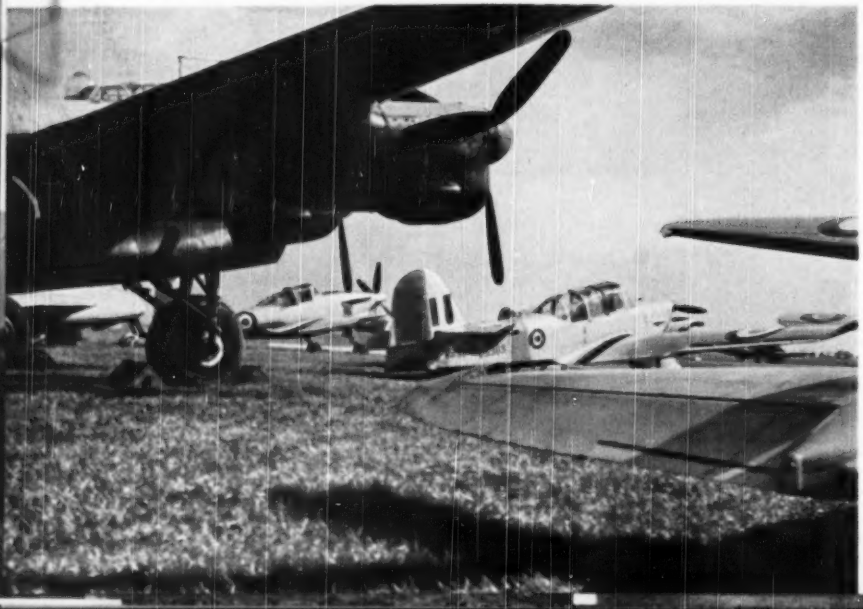


G.C. G. D. Stephenson, Commandant of the Central Flying School and pilot of the Harvard above, is expected to lead the formation, spelling the initials R.A.F., which will open the Display to-morrow. (Left) Chipmunks of Reserve Command, together with two Spitfire 22s of the Royal Auxiliary Air Force.

OTHER COMMANDS



Instructors, students and squadron commanders of the Central Flying School, which instils and maintains piloting skill in the R.A.F.



From C.F.S., which is based at Little Rissington, came this colourful composition of training aircraft. In the picture, framed by a Lancaster and Mosquito, can be recognized a Meteor 7, Balliol, Prentice, and, in the distance, fragments of a Chipmunk and Harvard.

H.S.P. Walmsley

FLYING TRAINING COMMAND

From Air Marshal Sir Hugh S. P. Walmsley,

K.C.I.E., C.B., C.B.E., M.C., D.F.C., Air Officer Commanding-in-Chief, Flying Training Command

SINCE 1945 many of the men who during the previous six years had won for us victory in the air have left the Royal Air Force. To make good this loss there is a need to train others who, in future years, will be our shield against aggression. Those who are now being trained will have to fly more costly and faster aircraft and shoulder even greater responsibility than did their predecessors. They must, therefore, have the best preparation which sound training methods, engineering skill and administrative talent can provide. This is our task in Flying Training Command.

We are responsible to the nation—to you—for seeing that the standards set for the efficiency of Royal Air Force flying personnel are properly maintained from the beginning of the cadet's flying training career until he reports for duty to an operational Command.

We must, however, do more than merely teach these young men to fly, as they will have to carry responsibility for a much wider range of tasks than those only concerned directly with flying. In all these activities, whether in the air or on the ground, a high standard of physical fitness and mental alertness is essential. Thoroughness, accuracy and good team work throughout are absolutely necessary in order to maintain the quality we need in our aircrew. To achieve this economically and efficiently we must be provided with volunteers of high physical and mental standards.

I hope you will enjoy the Display and will continue to give us the support and interest which we need in order to make a success of our task.

FLYING Training Command is responsible for the training of pilots, navigators and gunners and has functional control of the R.A.F. College, Cranwell, and the R.A.F. Flying College, Manby. Its instructors are also trained within the command. To meet this commitment the Command is organized into two major Groups, each controlling a number of stations and the two sub-groups of the R.A.F. College, Cranwell, and the R.A.F. Flying College, Manby.

Initial Training.—National Service men, men from civilian life who volunteer for a regular engagement as aircrew, and regular airmen employed in ground trades who elect to become aircrew, provide the chief source of supply of pilots. Having shown at the Combined Selection Centre, Hornchurch, that they have the aptitude to become pilots, these airmen spend 18 weeks at the Initial Training School. Here they are given their introduction to the Service, and receive instruction in elementary subjects allied to flying.

Flying Training.—The grounding received at the I.T.S. enables the pupil pilots to obtain maximum benefit from their next stage of training, at the Flying Training School. The course at F.T.S. is divided into equal periods of instruction on Prentice and Harvard aircraft, and culminates in the pupil being awarded his Wings, an essential qualification for which is a White Instrument Rating. The cadet who qualifies for his wings has learned to operate his aircraft with confidence and skill in most types of English weather. His ground and air training have laid the foundations of leadership necessary in an officer and captain of aircraft.

Advanced Flying.—On gaining their wings, pilots on regular engagements are posted to one of three Advanced Flying Schools, where they learn to fly an aircraft comparable with that which they will ultimately have to operate. The Mosquito-equipped A.F.S. trains pilots for light bombers and night fighters, and the Wellington A.F.S. feeds pilots to the operational Commands equipped with heavy aircraft. Pilots selected for day fighters receive training on Vampires or Meteors.

The R.A.F. College, Cranwell.—Cadets at the R.A.F. College receive flying instruction similar to that given to pupils at the F.T.S.s and reach wings standard at the end of their course. However, they spend 2½ years at Cranwell in order to cover the comprehensive ground syllabus designed to produce first-class junior officers possessing a sound humanistic and scientific education on which their future careers as permanent officers can be built. Those who successfully complete the course are granted permanent commissions and continue their training in the same way as F.T.S. graduates.

Navigator Training.—Selection of navigators for the R.A.F. is made from similar sources and in the same manner as that of pilots. Their training runs along parallel lines through the Initial Training Schools, Advanced Flying Schools and Air Navigation Schools.

At the A.N.S. the pupil navigator completes 200 hours' flying on Ansons and Wellingtons and receives comprehensive training in basic navigation, bombing and general Service subjects. From the A.N.S., the navigator goes either to the Wellington or Mosquito A.F.S., where he does 25 hours' flying in the company of the pilots under training. He then joins his crew at the Operational Conversion Unit.

Officer Cadets.—Flying Training Command introduced a scheme, which came into effect in January of this year, whereby all pilot and navigator cadets are classified as officer cadets and automatically enter the officers' mess in the 14th week of training. Commissions will be granted at the end of the F.T.S. and A.N.S. stage of training, subject to satisfactory completion of officer and flying training. Those who fail as officers but who obtain their wings will continue as aircrew, and those considered suitable as officers but who fail to obtain their wings, will be considered for ground commissions or signaller, engineer or gunner training.

The Central Flying School.—Experienced pilots of the R.A.F., the Royal Navy and Dominion and Allied Services are trained to become instructors at C.F.S. Great importance is attached to the quality of instructors on whom, ultimately, depends the fighting efficiency of the R.A.F. Before commencing their flying course, students are carefully selected and given a six weeks' officer leadership course.

At C.F.S. the student instructor imparts polish to his flying and learns the basic principles of flying instruction on the Harvard and Prentice. He practises the art of teaching on his fellow students. After completing his Harvard training, he will in future do ten hours on the Meteor 7, learning asymmetric flying technique and something of the problems of operating jet aircraft. On the ground, lectures are given in psychology, teaching technique and assessing of pupils.

C.F.S. Examining Wing.—Working in close collaboration with the staff instructors of C.F.S. are the members of the C.F.S. Examining Wing. They visit all units in the Home Commands of the R.A.F. and the Rhodesian Air Training Group which employ flying instructors. They provide the link between the C.F.S. and its products and assist in seeing that flying instruction is progressive and does not lag behind advances in operational technique and equipment. The Examining Wing appoints instrument-rating examiners and re-categorizes instructors.

Western Union Examining Squadron.—The Western Union Examining Squadron came into being on June 1st after a formative period of six months under the guidance of the C.F.S. Examining Wing. Its aim is to standardize flying training in the British, French, Belgian and Netherlands Air Forces at the highest possible level of efficiency. Its members are officers of each of the four Air Forces and its policy is directed by the Western Union Air Advisory Committee.

Central Navigation and Control School.—Both pilots and navigators of experience go to the C.N.C.S. to become instructors. The pilots undergo a course and graduate chiefly to the F.T.S.s to instruct in pilot navigation. Similarly, the navigators undergo a course to qualify them to instruct at A.N.S. and A.F.S. The syllabus includes overseas training flights.

Navigation Specialist Training.—A small number of officers are selected to take navigation specialist training at the C.N.C.S. They graduate possessing that extra scientific ability required in certain selected appointments in experimental and research establishments, and in some staff appointments. The latest navigational equipment is made available to the C.N.C.S. for their advice on its best use to the R.A.F.

C.N.C.S. Categorization Flight performs a function similar to that of the C.F.S. Examining Wing in maintaining navigation instruction at the highest possible standard.

Air Traffic Controllers.—The Joint Air Traffic Control Officers' course is incorporated in the C.N.C.S. and trains air-traffic officers for the R.A.F., R.N., and M.C.A., and airmen as runway controllers.

Weapons Training.—All pupils, pilots and navigators are given some basic weapons-training at F.T.S. or A.N.S.

The Central Gunnery School, equipped with Wellingtons, Spitfires, Meteor 4s and 7s, Vampire 5s and Tempest T.T.5s, runs five distinct courses. It trains pilot attack instructors, bombing instructors and free gunnery instructors.

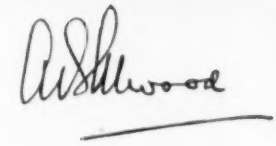
The Junior Weapons Course at the C.G.S. provides post-graduate training for regular General Duties Officers in the combatant aspect of their work. They complete 50 hours' flying, which covers all aspects of bombing, air-to-air firing, and ground attack problems.

Air gunners are also trained and complete 20 hours' flying. Further responsibilities are the demonstration of air attack for Service displays, the assessment and evaluation of weapons-training equipment, and the production of training literature.

The R.A.F. Flying College.—The first course at the R.A.F. Flying College commenced in January of this year. Selected squadron leaders and wing commanders of the General Duties Branch are being given practical instruction and experience in weapon employment, navigation and flying in all weather conditions. The College has an elaborate ground school set-up and is equipped with Harvards, Meteors (Mk. 4 and 7), Vampire 5s, Valettas and Lincolns. Flights are to be undertaken to America, where liaison with key establishments of the U.S.A.F. will be effected; and, similarly, students will fly to Canada, Australia and New Zealand. The problems of operating aircraft in extreme northern latitudes will be met at first hand in the flight to Canada, which will be routed as far North as possible, and during a series of flights from Iceland into Polar regions. The Flying College has representatives from the U.S., the Dominions and the Royal Navy on its staff and on the course.

TRANSPORT COMMAND

From Air Marshal Sir Aubrey Ellwood,
K.C.B., D.S.C., Air Officer Commanding-in-Chief, Transport Command



TRANSPORT COMMAND provides mobility for the three fighting Services. It was formed in the last war, when our shipping resources were severely strained and when it was vital that large numbers of much-needed aircraft should be ferried across the Atlantic.

It was Transport Command which made possible our first land victories against the Japanese when the 14th Army advanced into Burma. That army relied almost entirely on supplies by air for all its needs. In this operation 400 aircraft, British and American, were used and these aircraft took forward to our troops some 2,000 tons of supplies daily.

Later, in the final overthrow of Germany you will remember that it was that great fleet of transport aircraft and gliders which played so magnificent a part in the never-to-be-forgotten bridging of the Rhine at Arnhem.

Again, in more recent times, and in peace, Transport Command, accompanied by our American friends, supplied Berlin by air for nearly a year. How vital this was to the maintenance of peace few of us are even yet in a position to appreciate.

These few examples serve, perhaps, to remind us of the simple truth that in war—and even, at times, in peace—land and sea communications may well become difficult if not impossible, and it is under these conditions that air transport becomes essential.

I would stress that in these difficult and uncertain days, when by force of circumstances our fighting Services are comparatively small, our great Commonwealth cannot be strong everywhere; and so, in both peace and war, we must be prepared to reinforce rapidly any threatened area. This is the great asset of a transport force.

THE fact that economies are now being made in Transport Command should not be interpreted as indicating that its importance as part of a balanced air force has diminished. The present emphasis must be on the expansion of Bomber and Fighter Commands, and the available money and manpower is being used accordingly. Since the effective operation of relatively slow and unarmed transport aircraft is dependent on a high degree of air superiority, this decision is seen to be reasonable.

Economies have been achieved by a reduction in the number of home-based squadrons, and by cutting-down the administrative organization. There has been no serious curtailment in the scope of the Command's operational activities—nor in the enthusiasm with which they are undertaken.

Transport Command has a strategical and tactical function. In the first category fall the operation of trunk routes for the requirements of the armed forces, the strategic movement of units, reinforcement by air and air trooping, and aircraft deliveries and ferrying. The second category includes airborne assault, the carriage of troops into actual battle areas, tactical supply by air and casualty evacuation. Certain of these functions, including the operation of the medium-range force, special flights and ferrying, are the direct responsibility of the Command H.Q., while No. 38 Group is responsible for the long-range squadrons and Airborne Forces training.

Although the tactical function is perhaps the more spectacular, it is primarily confined to times of actual war. Training continues in peace-time, as well as an active programme of research into the use of new techniques and equipment. The twice-yearly demonstrations at Netheravon to students of the School of Land/Air Warfare give evidence of the progress in this field.

Operations in the strategical category, on the other hand, form a task which goes on from day to day, in peace and war. The growing mobility of modern warfare, and the consequent increase in the size and distance between theatres of war, makes it essential to move men and equipment from one theatre to another in the shortest possible time. When operational air forces are moved from one location to another in theatres where surface transport is inadequate, there must be air transport for the carriage of the ground personnel and equipment. Without transport aircraft, the strategic mobility of air forces would be no greater than that of land or naval forces, and a valuable asset of air power would be sacrificed.

The Transport Command trunk routes provide invaluable training and experience for this type of work, in addition to their immediate function of carrying official passengers and freight. The primary requirement of R.A.F. transport crews may be described as the ability to carry men and material anywhere in the world with regularity and safety. A considerable number of the R.A.F.'s most experienced aircrews are so employed. At present the trunk routes run to the Middle East, Singapore and Nairobi.

Training in strategic-mobility operations is provided by the regular carriage of Bomber Command ground personnel from England to the Canal Zone of Egypt for the monthly *Sunray* exercises (described in the "Bomber Command" section of this review). Two other recent examples were the carriage of ground personnel of the Lincoln squadron now operating in Malaya, and the move of No. 82 Squadron's men and equipment from West to East Africa. In both cases the use of air transport avoided the necessity for a long sea voyage.

It is important that transport squadrons shall be able to change quickly from their every-day role to some other task of greater urgency, and to a well-trained squadron such changes present few difficulties. It may be recalled that towards the end of the war the Dakotas of No. 46 Group, which had been employed almost exclusively on route flying, were switched on to the Rhine airborne assault with great success after only a brief period of special training, while a more

recent example of such a switch was the Berlin Air Lift.

The aircraft of Transport Command are the Handley Page Hastings for long-range operations and the Vickers Valetta for short-range work, while a number of Avro Yorks and Douglas Dakotas are still in service. Of the newer aircraft, both the Hastings and the Valetta have been designed for employment in both the tactical and the strategical role.

Although these aircraft are performing their duties well, much thought has been devoted to the basic types which should form the future equipment of Transport Command. Seven years of operating experience with many different types, most of them adapted from civil aircraft or bombers, has made it possible to visualize certain general requirements for Service transport aircraft.

A minimum of two distinct types is desirable. One should be a 300 m.p.h. long-range aircraft to be used in a purely strategical capacity.

The second type would be tactical. It would not necessarily be smaller than the long-range aircraft, but its most important feature would be the ability to operate from advanced airfields lacking long and costly runways and the other facilities found at normal trunk-route airfields. It would be slower than the long-range aircraft. In both types, particular attention would be paid to ease of loading and unloading.

Transport Command is the youngest of the major Commands in the R.A.F., having been formed in 1943 to draw together all the various existing formations then dealing with air transport, delivery and air routes, and to standardize and co-ordinate their work. The importance of the Command may be judged by the fact that by the end of the war it had become the largest R.A.F. Command, controlling nine Groups at home and overseas.

It was transport aircraft which made possible the victorious march of the 14th Army through Burma in 1945. Four hundred of them, British and American, supplied the 14th Army with 2,000 tons of supplies a day—98 per cent of the Army's requirements. Later, transports were employed in a very different task when they dropped across the Rhine two complete divisions in one-and-a-half hours. For this more than 1,000 machines were used, and as many gliders.

T. M Williams

BRITISH AIR FORCES OF OCCUPATION

From Air Marshal T. M. Williams,

C.B., O.B.E., M.C., D.F.C., Commander-in-Chief, British Air Forces of Occupation

WHEN I assumed command of the British Air Forces of Occupation, the Berlin Air Lift was barely four months old. It continued to fill much of our thoughts for a further eleven months, until we were assured that surface communications between Berlin and the West had been restored.

The Air Lift is probably the best-known feat of the Royal Air Force in Germany and is, I am sure, one that will long be remembered, not only as an outstanding example of sustained air supply but also as an example of joint Anglo-American and Commonwealth action.

However, B.A.F.O. has, and has had for five years, other responsibilities, less publicized but still very important. We are part of the occupying forces in Germany, with duties to fulfil towards the civil power. We are part of the forces of Western Union, already deployed on the Continent of Europe. Moreover, we are able to train and exercise continuously with the Army and thus practise, and try to improve, the techniques of a tactical air force.

I cannot, in this space, describe our duties more fully but they provide absorbing and exciting tasks. There is plenty of work, and a wide range of opportunity, for officers and airmen. The Royal Air Force has always been an adaptable and flexible Service, and has constantly aimed at being an efficient, fast and powerful fighting force, capable of meeting all demands made of it. We in B.A.F.O. are striving towards this aim and it is my hope that we perform our varied tasks in a manner worthy of the Service to which we belong.

THE British Air Forces of Occupation was formed as an an Overseas Command of the R.A.F. on July 15th, 1945, founded on the hard core of 2nd Tactical Air Force, the war-time formation which it superseded. Its primary function was the air policing of the British Zone of Germany.

The Economic Advisory Commission of December, 1944, had divided Germany into territorial zones and the capital city of Berlin into sectors for occupation by allied forces at the conclusion of the war in Europe, which 2nd T.A.F. at that time was still prosecuting. This was the original authority for the existence, in the British Zone of Germany and the British Sector of Berlin, of units of the R.A.F. subsequently known collectively as the British Air Forces of Occupation. B.A.F.O. was accorded the status of a Command and headed by an A.O.C.-in-C.; in November, 1949, the title was changed to Commander-in-Chief.

It is natural that the policy and organization of the Command has undergone many changes during its five years of occupation. Before the Command could settle to its primary duty of policing the British Zone, there were destructive and constructive tasks to face in connection with demilitarization. When the war ended there were nearly half a million Luftwaffe personnel in the British Zone and nearly 4,000 aircraft. By the end of 1945, most of the Luftwaffe had been disbanded, and personnel were absorbed by the British-controlled German Civil Labour Organization. A few aircraft were preserved for record and museum purposes; the remainder were "reduced to produce." Vast quantities of munitions were disposed of through a special Air Disarmament Branch at Headquarters, B.A.F.O.

Selected airfields for use by the B.A.F.O. required restoration and rehabilitation. An early major project was the building of the communications airfield at Buckeburg to serve the R.A.F. and Army Headquarters in the British Zone. This airfield also functions as the R.A.F. entry and exit airfield for the Zone. During the Berlin Air Lift, R.A.F. Airfield Construction Wings rebuilt whole airfields to improve the flow of supplies to Berlin, maintaining at the same time a high standard in repair and rehabilitation work at all R.A.F. establishments in Germany.

B.A.F.O.'s early internal air-transport commitments were heavy. Subsequently, B.E.A. from the British Zone, and other civil companies, linked Berlin with the rest of Europe. An R.A.F. service still links Warsaw and Berlin with London twice weekly, Buckeburg and Gatow serving as staging posts. Additional services operate between Buckeburg and Northolt for the British Service element. During the war criminals' trials Mosquitoes ferried documents daily between Germany and London; in the heavy winter of 1946-47, supplies were dropped in the Friesian Islands, normal communications channels having been closed by abnormal weather; later, B.A.F.O.'s heavy responsibility in the sphere of air transport was illustrated during the blockade of Berlin.

It was laid down that B.A.F.O. should provide air defence for the British Zone of Germany and the British Sector of Berlin indefinitely. Air policing was achieved by training and routine flights by tactical and reconnaissance squadrons. Armament training and support roles for British Army of the Rhine were carried out, and, from the earliest days, the Command's tactical forces have taken part in exercises, manoeuvres and displays both on the Continent and at home.

The Command employs two types of German Labour—directly employed, and members of the German Civil Labour Organization. Both types played a vital part in support of the Command's contribution to the Air Lift.

Much of the work of the Air Ministry Missing Research Enquiry Section was carried out in B.A.F.O. by a special R.A.F. unit. By the end of September, 1949, the bodies of 30,000 officers and airmen of the R.A.F., Dominions and Allied Air Forces, missing from operations over North-West Europe, had been located and identified. Some 5,000 unknown cases remained and 10,000 are considered to have been lost in the sea or have no known grave. No fewer than 82 per cent of

the graves bluntly marked "Unknown airman," were identified on exhumation after painstaking research by M.R.E.S.

When Russia imposed the blockade of Berlin in 1948, a tremendous challenge was thrown at the British and American Occupation Air Forces. Both answered it magnificently and an Air Lift of supplies for 2½ million inhabitants of West Berlin began. On the British side, reinforcements came from Transport Command, since the B.A.F.O. squadrons were fighters and light bombers, as befitted a tactical Air Force, and these squadrons had to continue the tactical role. A Transport Command Group was strengthened by the grafting of other long-distance transport aircraft on to it, and the whole force transported to Germany.

In the course of the Operation *Plainfare*, the efficiency of B.A.F.O. was put to the test and was not found wanting. American Skymasters operated from two R.A.F. stations in the British Zone of Germany; more than half the total Air Lift tonnage was, in fact, lifted from the British Zone to Berlin. At one time, eight supply airfields stretched across the two Allied Zones in a 400-mile-wide arc facing the beleaguered Western Zones of the city. When, on October 6th, 1949, after 15 months' operations, (the American Operation *Vittles* ceased on September 30th), a Hastings flew a load of coal from Schleswigland to Gatow on the last Air Lift flight, 2,326,205 short tons of supplies had reached Berlin in 277,728 flights by aircraft of the Combined Air Lift Task Force. R.A.F. Station, Gatow, in the British Sector of Berlin, handled 860,425·5 short tons of supplies for the city.

By the end of 1949, the rearguard of the British elements of the Combined Air Lift Task Force had left Germany. B.A.F.O. was left to continue its tactical role, which had never been neglected, but with the additional problem now of maintaining certain installations ready against the possibility of a resumed Air Lift.

The responsibility for B.A.F.O.'s Air Defence brief belongs to a Tactical Group which maintains an ambitious training programme in conjunction with British Army of the Rhine and Western Union Air Forces. The Group comprises Mosquito tactical bomber and Vampire fighter/bomber wings, a Spitfire Tac R/P.R. and Auster A.O.P. squadrons. Training flights employ Mosquitoes, Ansons, Proctors, Oxfords, Austers, Harvards and Meteor 7's. Communications flights employ Dakotas, Devons and Ansons.

Bombing and air-firing ranges are maintained. Photographic coverage by the P.R. Flights is an air policing and training commitment. The maintenance of fighter director posts, radar coverage, G.C.A. systems, and a Command operations centre are among the Group's operational commitments. An armament practice camp accommodates regular detachments of Fighter and Reserve Command Squadrons from the U.K. in addition to the Group's own Tactical Squadrons. Fighter Control Units of Reserve Command are also attached to B.A.F.O. for training in operations, radar and wireless trades.

For the last four years, a Maintenance Depot has been responsible for the supply of most requirements of the R.A.F. units in Germany and Austria. From time to time other, smaller, depots have operated to meet special requirements.

The proportion of National Service Entrants posted to the Command for duty is high and one of the larger problems is that connected with constant turnover in complement. Service with the R.A.F. in Germany is a popular tour of duty and probably nowhere else does the National Service airman conduct himself more conscientiously.

Within the framework of the Command there is a specially honoured place for the Women's Royal Air Force. The first station in the whole of the R.A.F. to have its entire complement of women personnel belonging to the new W.R.A.F. was in B.A.F.O.—R.A.F. Station Wunstorf, the veteran Air Lift base from which Operation *Plainfare* began and which consistely bore the brunt of the British effort. Other stations were quick to follow Wunstorf's lead. W.R.A.F. personnel are employed in a wide variety of trades, and they work well alongside the men. Normal tour of duty for women in Germany is two years, compared with 2½ years for men.

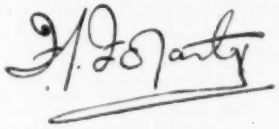
Reference to B.A.F.O. would not be complete without mention of the excellent facilities for sport within the Command. All sports are organized on a Command basis and are available to all ranks, subscriptions being amazingly small. Perhaps the most remarkable facilities are those for riding, winter sports and gliding. There are several leave centres in Germany within the airman's means, where facilities for these sports in particular have been the attraction to hosts of travellers abroad before them. Gliding, a legacy from the Luftwaffe, is one of B.A.F.O.'s most popular sports, and the R.A.F. Rest Centre at Scharfoldendorf, some 40 miles south of Command Headquarters, in the Harz Mountains, is the home of the Headquarters Gliding Club. At least one British National record has been set up at one of the several gliding clubs in the Command, which between them own more than 50 high-performance sailplanes and gliders.

FAR EAST AIR FORCES

From Air Marshal F. J. Fogarty,
C.B., D.F.C., A.F.C., Commander-in-Chief, Far East Air Force

IN the Far East to-day the Royal Air Force is playing a vital part in the war against evil forces now threatening the life of the people. By far our most important task is the defeat of terrorists in Malaya. In this campaign our main efforts are concentrated on rendering every possible assistance to the ground forces in their grim jungle war, not only by direct air attack, but also in the very important role of air supply, without which our ground forces could not operate in the jungle. In Hong Kong our squadrons are ever at the alert, ready to meet any threat to the safety of the colony.

The war now being fought must be won if the people are to remain free to live their own lives. The Far East Air Force is determined to play its full part in winning this war and to meet all demands that may be made on it.



THE Far East Air Force, with its Headquarters at Changi, 17 miles east of Singapore, is the Command most remote from the Air Ministry, yet is, perhaps, the one most in the public eye, because it contains the area where the Royal Air Force is most actively engaged—Malaya—and places where the garrison remains on the alert against attack—Hong Kong and the New Territories.

Geography always plays a large part in determining the problems that face an overseas command of any kind. The Far East Air Force is no exception to this rule. Not only is it responsible for the supervision and control of millions of square miles of sea and land extending through more than 30 degrees of longitude and reaching from the Equator to the Tropic of Cancer, but the area of the sea far exceeds that of the land.

The land area roughly resembles a narrow circular belt, rising north east from the island of Ceylon towards that of Hong Kong, bordered by the Indian and Pacific Oceans. In the main, the area consists of great stretches of dense jungle or of marshy swamp interspersed with a few large areas of civilization where, alone, landing grounds are to be found.

The scarcity of airfields has a profound effect on the whole framework of the Command in that the focal points—that is, the major airfields—have all been developed at the edge of the land mass, and the most direct route between each lies over water for the greater part of journeys involving many hours' flying. The direct route from Negombo in Ceylon to Tengah is 1,700 statute miles, while that from Changi to Hong Kong via French Indo-China is only a hundred miles less.

All this entails a wide dispersal of force, with an H.Q. and source of supply in the centre. The Far East Air Force has four subordinate formations, one on each flank, the others in the centre. On the west is A.H.Q. Ceylon, with its main air-

("*The Commands of the R.A.F.*" *is continued on page 57.*)

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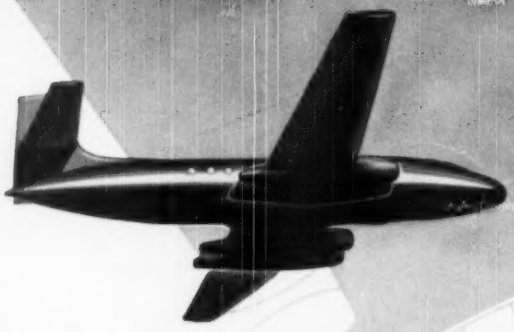

more passengers . . . fewer aircraft

In presenting the AVRO Jetliner for consideration by airline operators in the medium-range field AVRO Canada is sincerely aware of the responsibility it must assume in the introduction of this new and dynamic medium of *Jetflight*.

Facts and figures about the Jetliner's performance, carefully acquired during the past eight months, merit immediate attention by interested operators. They will be agreeably surprised about the economic advantages of the Jetliner. Their flying customers will be even more pleased with the quiet, restful, vibrationless comfort of Jetliner flight. Pilots, crews and maintenance personnel will find their duties and work simplified.

AVRO Canada is prepared to submit studies of Jetliner application which will show how its high cruising speed can improve schedules and influence the flying habits of this generation.

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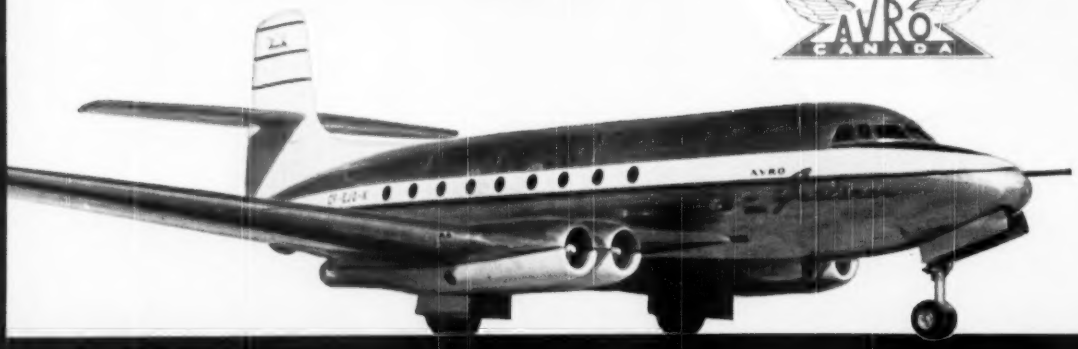

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An R.A.F. Sunderland flying over the Esso Refinery, Fawley, Southampton Water.

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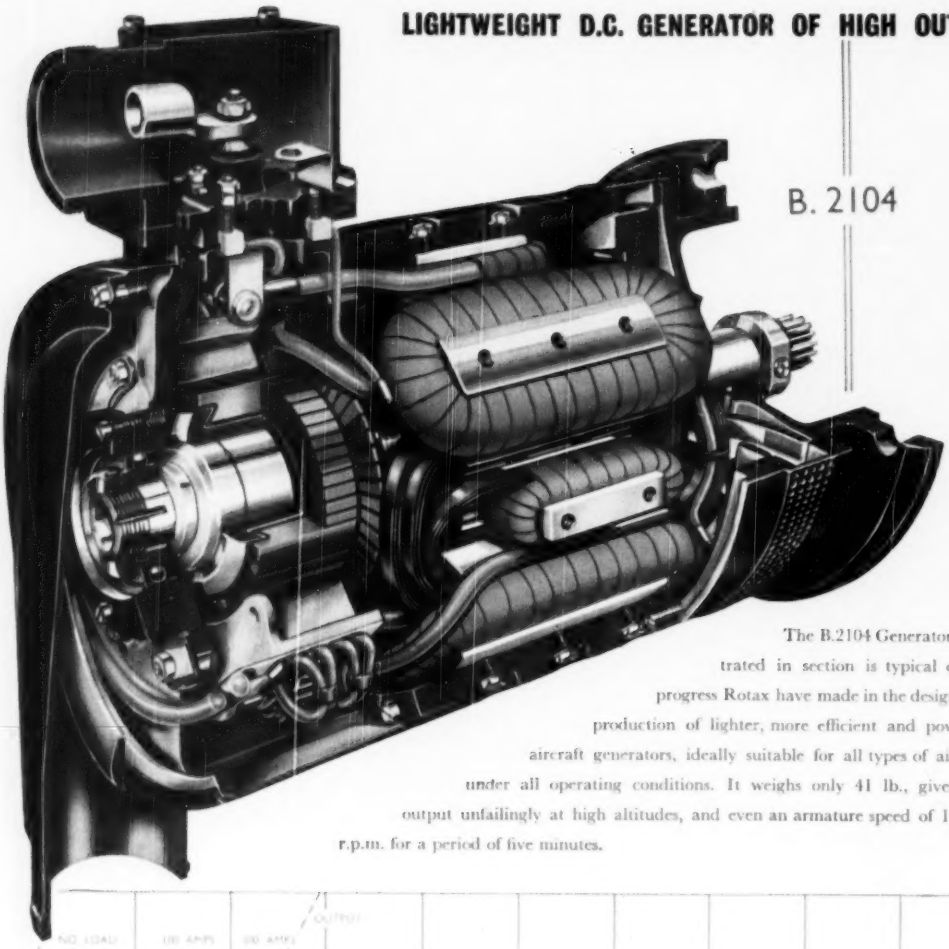
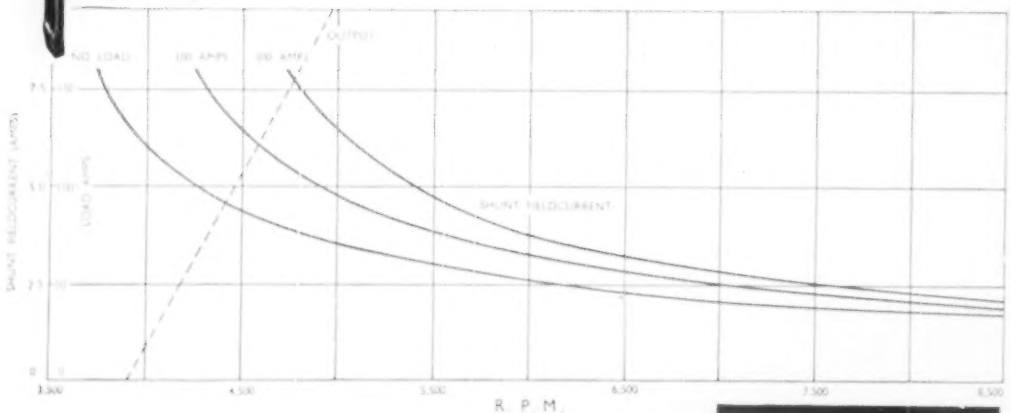


The B.2104 Generator illustrated in section is typical of the progress Rotax have made in the design and production of lighter, more efficient and powerful aircraft generators, ideally suitable for all types of aircraft under all operating conditions. It weighs only 41 lb., gives full output unfailingly at high altitudes, and even an armature speed of 10,000 r.p.m. for a period of five minutes.



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FIGHTING STOCK

How R.A.F. Aircraft, Power Plants and Weapons Have Developed Since 1912 : Contrasts and Comparisons

THOUGH many of the great fighting aircraft of the past are already invested with considerable legendary fame, a number of them are less known than they deserve. This is because in war-time their characteristics were jealously guarded, and peace, as always, brought apathy—except of course, to those dyed-in-the-wool enthusiasts to whom the details of an almost forgotten gun mounting, or the prefix to an obscure serial number may be matters of weighty significance.

Being by no means exhaustive, these pages are not addressed primarily to those expert few, but are intended as a guide for the many who, though less steeped in aircraft lore, may still be eager to learn how the splendid machines due to perform at Farnborough this week-end are truly come of fighting stock. Excluded—for they would best be reviewed in an issue devoted to Naval Aviation—are types common to the Royal Naval Air Service, or used in more recent times by the Fleet Air Arm and Naval Aviation. It may be remarked, incidentally, that many French (in 1914-18) and American types have played their part in R.A.F service. The illustrations of 1914-18 aircraft reproduced in the following pages are mostly Crown copyright, and appear by courtesy of the Imperial War Museum. Others are mainly *Flight* photographs.

Though the declared scope of this brief study is 1912-1950, the various classes of military aircraft did not begin to evolve along well defined lines until the war of 1914, so relatively little attention need be paid to the very earliest types. It is true that the art of reconnaissance was being exploited in manœuvres well before 1914, but serious fighting and bombing were still mere prospects in the more imaginative minds of the period.

In the chronicle of British military flying, the year 1912 was an especially momentous one. Not only did it see the creation of the Royal Flying Corps, but it was the period of the famous Military Aeroplane Trials at Larkhill, and of extensive Army manœuvres, in which air reconnaissance proved so successful as utterly to confound the plans of the directing staff. Following these exercises General Grierson wrote of the aircraft involved : " The impression left on my mind is that their use has revolutionized the art of war. So long as hostile aircraft are hovering over one's troops, all movements are liable to be seen and reported, and therefore the first step in war will be to get rid of the hostile aircraft. He who does this or who keeps the last aeroplane afloat will win, other things being approximately equal." With what force the general's contention was soon to be proved !

"SCOUTS" AND FIGHTERS

ALTHOUGH the miscellany of frail-looking Farmans, Avros, Bleriots and B.E.s which landed in France during August, 1914, included no type designed specifically for air fighting, an aircraft of this sort—the two-seater Vickers Fighter, or "Gun Bus"—had been successfully tested during the preceding year and production was in hand when war came.

Within a few months a handful of Gun Buses powered with Gnome rotaries, and mounting a free machine gun in the nose, were giving a good account of themselves in action against enemy types of higher performance. By this time the importance of speed and rate of climb had become obvious; so, though not originally intended for air combat, the lively Bristol, Martinsyde and Sopwith tractor biplane "scouts" were pressed into service in an offensive role. (It may here be noted that the generic term "scout" was used throughout the war to describe what would be known to-day as a fighter.) A pistol, or a rifle or two—jury-rigged machine guns came later—formed the early armament of these clean-lined single-seaters, but for the most part air fighting in the opening phases of the war fell to the lot of reconnaissance machines, wherein the observers contrived to provide themselves with a variety of ordnance which would not have disgraced a good gunsmith's shop.

A precept firmly established in 1914-15, but not always recognized to-day, is that a fighter aircraft is no better than its armament. To the Germans—or, more correctly, to the Dutchman Anthony Fokker, who designed some of their best fighters—the credit is due for the first major advance in the arming of aircraft during the first world war. It was Fokker who first adapted an axially-fixed machine gun to fire harmlessly between the blades of a tractor airscrew.

Soon after the battle of Loos the menace of the enemy's new armament assumed the proportions of a veritable scourge, and the slow, ill-protected Allied reconnaissance

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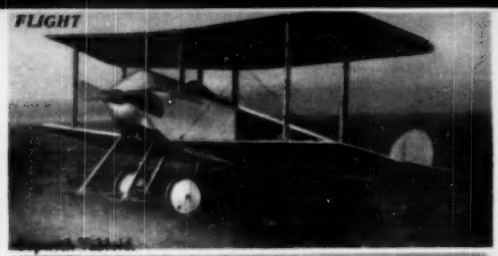
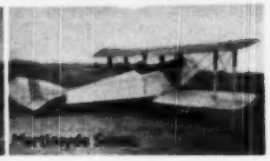
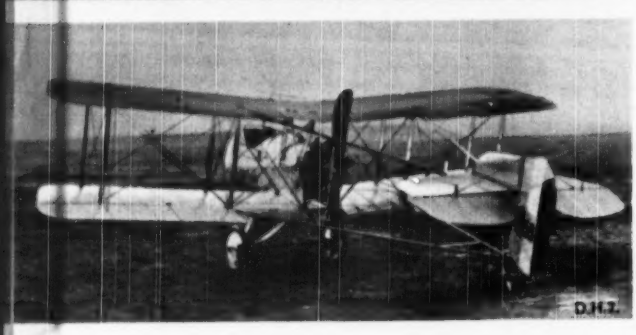




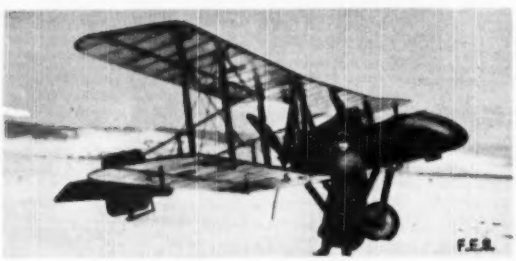


"SCOUTS" AND FIGHTERS

aircraft—"Fokker fodder"—fell at an alarming rate to the synchronized Spandaus of the little enemy monoplanes. But by early 1916 the pendulum of supremacy was swinging back, and the spring of that year showed that the D.H.2 and F.E.2B pusher biplanes had the measure of the German fighters. The D.H.2 was a rotary-engined single-seater with a drum-fed Lewis gun freely mounted in front of the pilot, and the "in-line"-powered F.E. carried a gunner, variously armed with one or more pedestal-mounted Lewises.

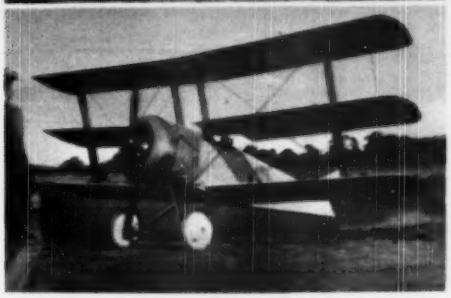
It is instructive to compare the old D.H.2 with the jet-propelled Vampire 5, the latest de Havilland type in R.A.F. service. Remarkably enough, though the Vampire compares with its "stick-and-wire" ancestor as would a Centurion tank with Boadicea's chariot, there is an essential point of similarity in that both machines are of twin-boom layout, with the pilot seated far forward in the central nacelle; but whereas the D.H.2 was so designed to allow a forward-firing gun to be installed in the nose, the modern jet is similarly planned to permit the most favourable installation of its Goblin turbojet.

Dimensionally, the Vampire is appreciably the larger machine, its cantilever 38ft wing spanning some 10ft more than the biplane cellule of the D.H.2. To a great extent it is the generous area of the Vampire's wing which endows it with the brilliant performance at height and general docility of handling for which the type is famed; but whereas the wing loading, at about 40 lb/sq ft, is to-day considered abnormally low for



Martinsyde Elephant.

Sopwith 1½-Strutter.



a fighter, it is still more than *seven times* that of the early biplane!

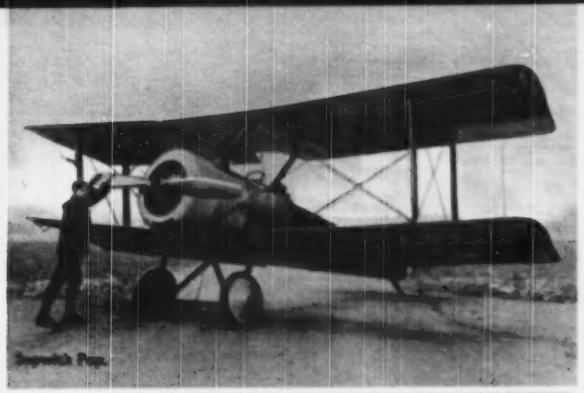
With a speed of 100 m.p.h. (to give it the benefit of a slight doubt), the D.H.2 was considered no sluggard in its day, yet a standard Service Vampire 5 is nearly five-and-a-half times as fast. This is due largely to the aerodynamic efficiency of its airframe but in even greater measure to the 3,100 lb thrust of its Goblin turbojet—equivalent to nearly 4,500 b.h.p. at top speed. If the Gnome *monosoupape* rotary engine of the D.H.2 were on its best behaviour, it would give forth all of 105 h.p. from its nine whirling cylinders!

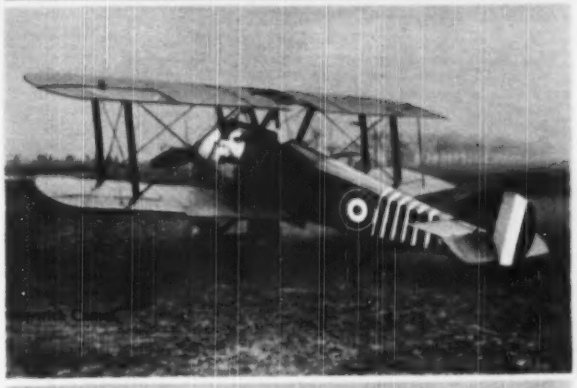
As for climbing power, it is amusing to speculate that after watching a D.H.2 take-off, an R.A.F. Vampire pilot could drop into the mess for a leisurely cup of tea before getting away himself, and yet be waiting at 10,000ft when the old warrior—twenty-five minutes after leaving the ground—finally came level. Thence, if he chose, the jet pilot, snug in his pressurized cabin, could again swing the Vampire's nose skyward and continue his climb far above 40,000ft, while at 16,000ft or so the old-timer would begin to fall out of the sky for lack of "horses."

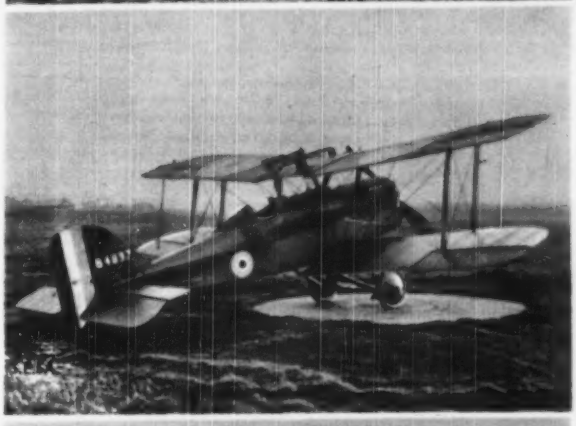
If it came to a fight (perish the patricidal thought), the D.H.2 would have to depend on a single Lewis gun, supplied with a few spare drums of ammunition disposed around the cockpit, and in all probability the whole aircraft would disintegrate if struck by a single 20 mm high-explosive shell fired by the Vampire—and the Vampire's magazines contain, in all, 600 rounds to feed the four Hispano cannon firing out through the nose! It is by no means certain, however, that the Vampire pilot could draw a bead on the D.H.2 if the old-time pilot exploited fully its slow-flying qualities and radius of turn—by present-day standards amazingly short.

Finally, whereas the pilot, gun, ammunition, fuel and oil represented a full load for the 1915 biplane, the Vampire cheerfully handles eight 60-lb rocket projectiles, *in addition* to two 500-lb bombs and its full internal load.

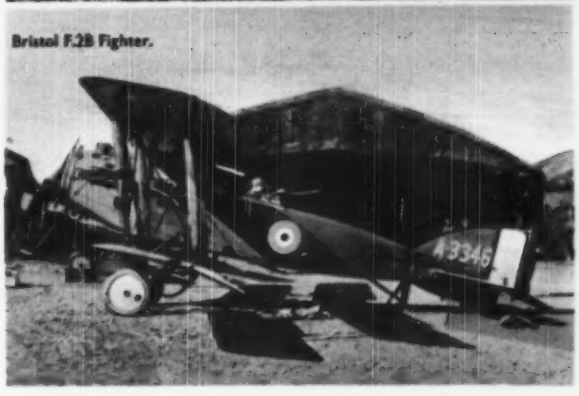
Our narrative of technical progress may be resumed with the introduction of the two-seat Sopwith 1½-Strutter in 1916, by which time the "circuses" of Richthofen and Boelcke had our airmen at a serious disadvantage in equipment. The 1½-Strutter (so dubbed because its inboard wing-bracing comprised long and short struts) was something quite new in having a fixed Vickers gun, with Sopwith-Kauper synchronizing gear, for the pilot, and a Lewis gun on a Scarff ring mounting for the







Bristol F.2B Fighter.



"SCOUTS" AND FIGHTERS . .

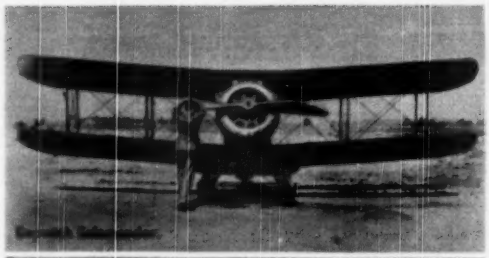
observer. This "sting in the tail," in conjunction with excellent handling qualities, gave the "Strutter" a brief ascendancy; but once again performance told, and this pioneer Sopwith was soon outclassed by the enemy's new Albatros and Halberstadt fighters.

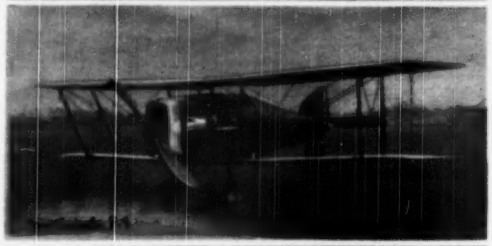
Happily the little Sopwith Pup—a fighter esteemed by many pilots of renown as the most perfect flying machine of the 1914-18 war—now came whirring its way into the sombre scene. The Pup was one of those aircraft which look, and are, just "right." It was compact (span, 26ft), lightly loaded (1,300 lb gross), sensitive in control, and of adequate, though not especially high, performance, for the engine was generally a Le Rhone of only 80 h.p. Especially important was its ceiling of nearly 18,000ft. Armament was a single Vickers gun, whereas the Germans had taken to pairing their Spandaus.

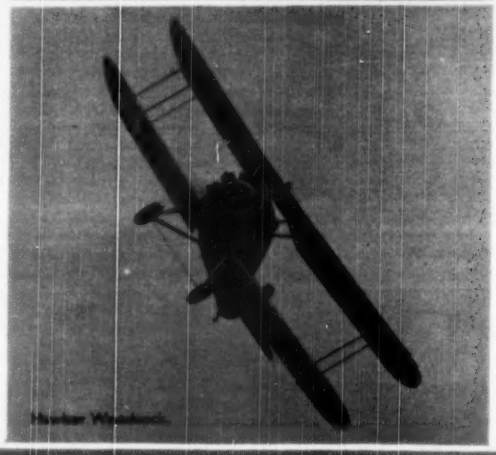
Though as a flying machine the Pup was beyond reproach, its successor, the Camel, displayed certain abnormalities, notably that of turning extremely rapidly to the right, due to the gyroscopic force of the rotary engine. According to the experience of the pilot, this characteristic could be a boon or a danger; but Camels destroyed more enemy aircraft than any other type and rank among the truly great fighters of all time. The Camel, moreover, was the first British fighter to mount twin Vickers guns, a basic armament which was to be retained on R.A.F. fighters until well into the 1930s.

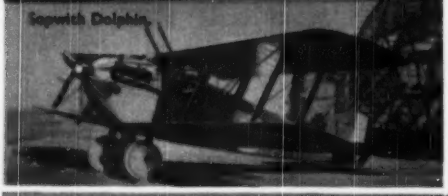
Only the most commonly used fighters, and those of the greatest technical interest, can receive individual mention; but our collection of photographs (incidentally, one of the most complete of its kind yet published) includes a fair selection of the lesser-known operational machines. Among the early fighters worthy of special consideration here was the S.E.5, a contemporary of the Camel and likewise extremely successful. It was far and away the most promising design to emanate from the Royal Aircraft Factory (later the Royal Aircraft Establishment), at Farnborough. The engine was an eight-cylinder vee water-cooled Hispano-Suiza, or a Wolseley Viper of similar pattern; in some machines the airscrew had a reduction gear. Only one Vickers gun was fitted, but there was a Lewis gun above the top wing on a special track mounting, enabling it to be pulled downwards by the pilot when he needed to change an ammunition magazine.

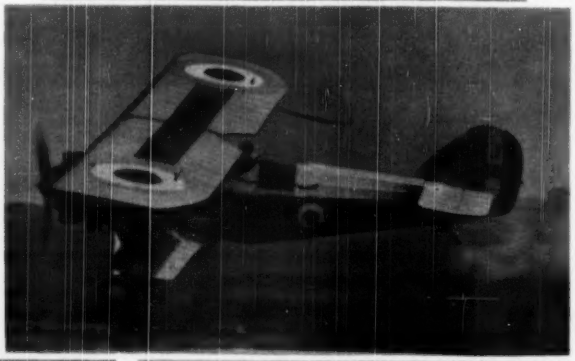
The two-seat multi-gun formula, initiated by the 1½-Strutter, was developed to a very high degree in the Bristol F.2B Fighter, the most successful of its class ever built. With a Rolls-Royce Falcon engine the "Brisfit" was

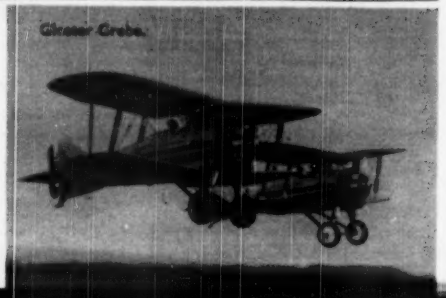


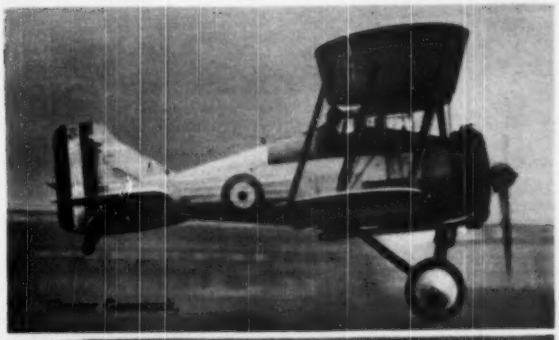


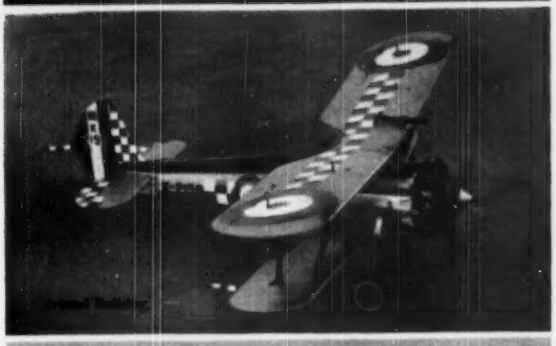


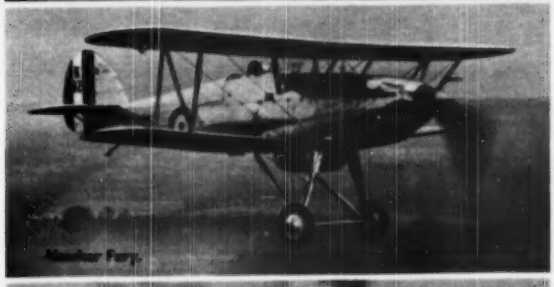


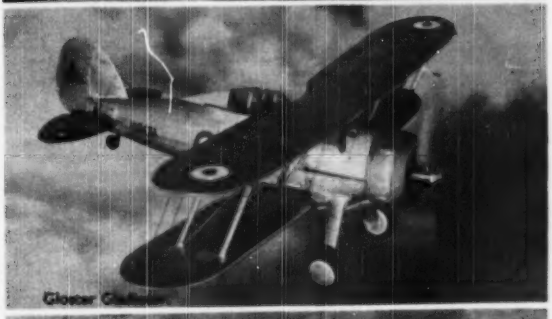


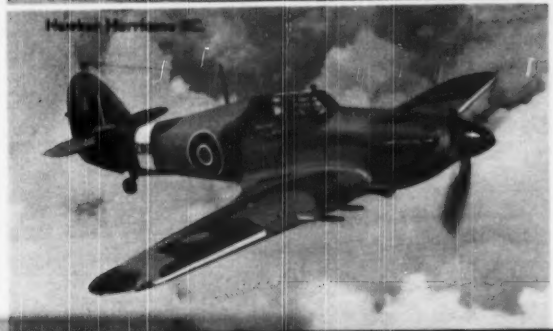


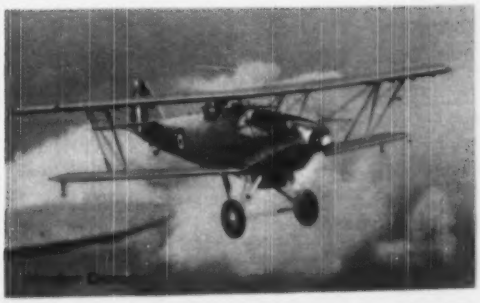










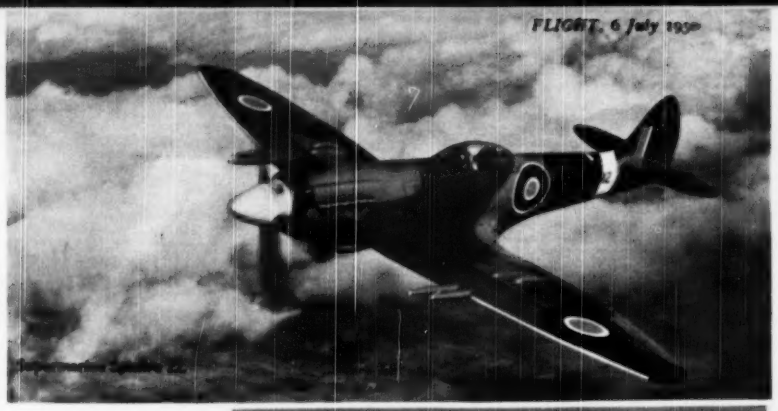


capable of 125 m.p.h. and the service ceiling was 20,000ft. The pilot had a Vickers gun and one or two Lewises were ring-mounted over the rear cockpit. It was this rear armament which proved the undoing of many an adversary.

The later types of World War I fighters were often engaged on low-flying, and dive-bombing attacks, with 20-lb Cooper bombs, and when suitable targets presented themselves they achieved good results, but casualties were high, for there was no armour protection. The first fighter to be built specially for trench-strafing was the Sopwith Salamander, in which the pilot was well protected and had four or six machine guns.

A near-relation of the Salamander, the more famous Snipe was destined to remain in service for many years after the war. A 120-m.p.h two-bay biplane fitted with a 230-h.p. Bentley rotary, it was the last rotary-engined fighter to be accepted for service. Succeeding types, common in the 'twenties, had the fixed, air-cooled nine-cylinder Bristol Jupiter or 14-cylinder Armstrong Siddeley Jaguar radial. They were compact, highly manœuvrable, but hardly as fast as they might have been had more careful attention been paid to aerodynamic design; they were typified by the Armstrong Whitworth Siskin, Hawker Woodcock and Gloster Grebe and Gamecock. Without exception they were very popular. A few Siskins had supercharged engines and were the first in service to be so powered. Many a high-ranking officer to-day speaks wistfully of these stubby little biplanes—his early loves.

Performance received a decided fillip in the all-steel Bristol Bulldog; the Rolls-Royce-engined Hawker Fury; the Gloster Gauntlet (a surprising reversion to the two-bay wing cellule); and the somewhat similar, but faster, single-bay Gladiator, with Mercury engine. These were fine all-rounders, in the best British tradition, but the Fury was designed with special regard to interception. For its period it had an astounding rate of climb; but how does this 1930 biplane compare with the Gloster Meteor 4 serving the R.A.F. to-day? The supercharged Kestrel engine, we find, delivered 480 h.p. at 11,500ft, at which height the top speed was a few m.p.h. over 200. On the 20,000 equivalent horse-power of its twin-Derwent turbojets (likewise, of course, Rolls-Royces) the Meteor 4 attains 580 m.p.h. at the same level. The Fury climbed to 20,000ft in just under ten minutes and was armed with the traditional two machine guns; the Meteor 4 reaches the



"SCOUTS" AND FIGHTERS . . .

same height in 3½ minutes and carries four 20 mm cannon. Already, the improved Mark 8 is being delivered to the Service.

A contemporary of the Fury and Bulldog was the Hawker Demon two-seater fighter, developed from the Hart day bomber and once again following the layout of the old 1½-Strutter. That monoplane fighters had not been favoured up to this time is, in brief, accounted for by their greater weight and lower strength; but by the middle 'thirties the inexorable demands of performance were beginning to prevail. Orders were placed—and the continuance of our world as we know it is largely due to this very fact—for the Merlin-engined Hawker Hurricane and Vickers-Supermarine Spitfire, superb eight-gun monoplanes which came as a revelation to all nations. Though showing a speed increase of 100 m.p.h over their predecessors (the Hurricane achieved 330 m.p.h. and the Spitfire 367 m.p.h.), they retained to a remarkable degree the handiness of the old biplanes; but, naturally, they needed more sky-space for their manœuvres. Both, in diverse forms, were to see the war out, and even to-day the "Spit" continues to serve as a reconnaissance/fighter. One ground-attack version of the Hurricane mounted two 40 mm guns and both Hurricane and Spitfire operated with rocket projectiles and bombs.

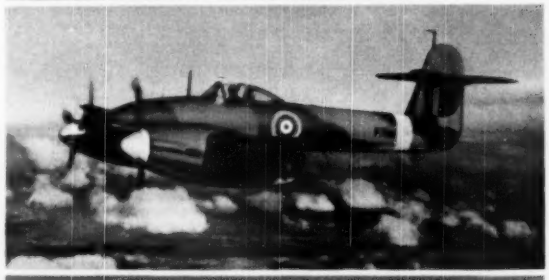
The last milestones on the road of development can now be easily discerned. One of these was the pre-war-designed Boulton Paul Defiant, a two-seater of excellent flying qualities, in the 1½-Strutter-Brisfit-Demon tradition, but having no front guns, the armament of four 0.303in Brownings being concentrated in a protective, power-driven turret. The Defiant made its mark over Dunkirk and later served as a night fighter.

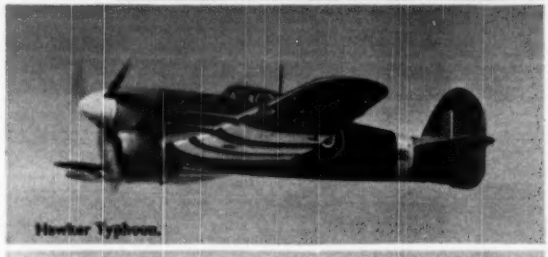
The need became urgent early in the war for a twin-engined fighter capable of long endurance and suitable for night operation with the then-new "airborne interception" radar. Bristol Blenheim conversions and "cat's-eye" Hurricanes served for a time until the advent of the sturdy, hard-hitting Beaufighter, which stood a long and faithful sentry-go in the night skies before being relieved by the Mosquito. To-day the Mosquito N.F.Mk.38, with two Rolls-Royce Merlin 113 engines, is our standard night fighter. Fine a machine as it is, however, a jet-propelled replacement is already overdue.

Even yet three important types are missing from our company of illustrious piston-engined fighters—the Hawker Typhoon and Tempest, and the de Havilland Hornet. The "Tiffy" will always be remembered for its summary dealings with fast German sneak raiders and, more especially, for its devastating rocket attacks on ground targets. Even faster was the Tempest, which built up a wonderful record of flying bombs destroyed and which continues in service to-day. Versions were built with the 24-cylinder Napier Sabre liquid-cooled engine, and the 18-cylinder Bristol Centaurus. The Hornet, typified by the F.Mk.3, and built to the same formula as the earlier Westland Whirlwind, is a single-seater with two Rolls-Royce Merlin engines, four 20 mm guns and a speed of 472 m.p.h. at 22,000ft. Maximum range is over 2,500 miles.

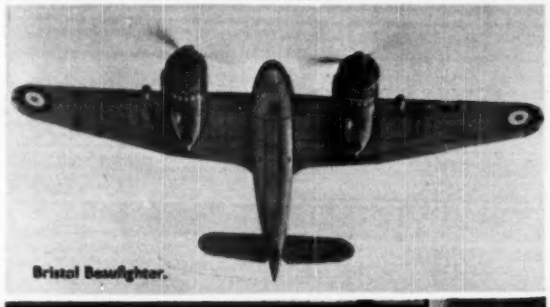
It now remains only to record the historic introduction of jet propulsion. In this connection we may take pride in recalling that the Rolls-Royce Derwent and de Havilland Goblin turbojets now serving the R.A.F. in the

Boulton Paul Defiant.

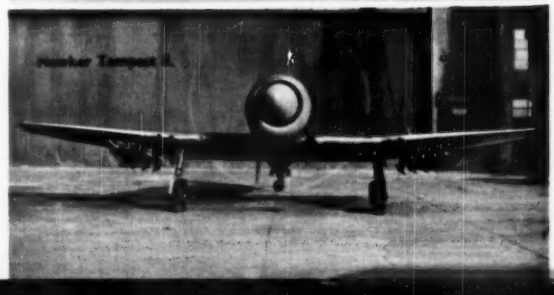


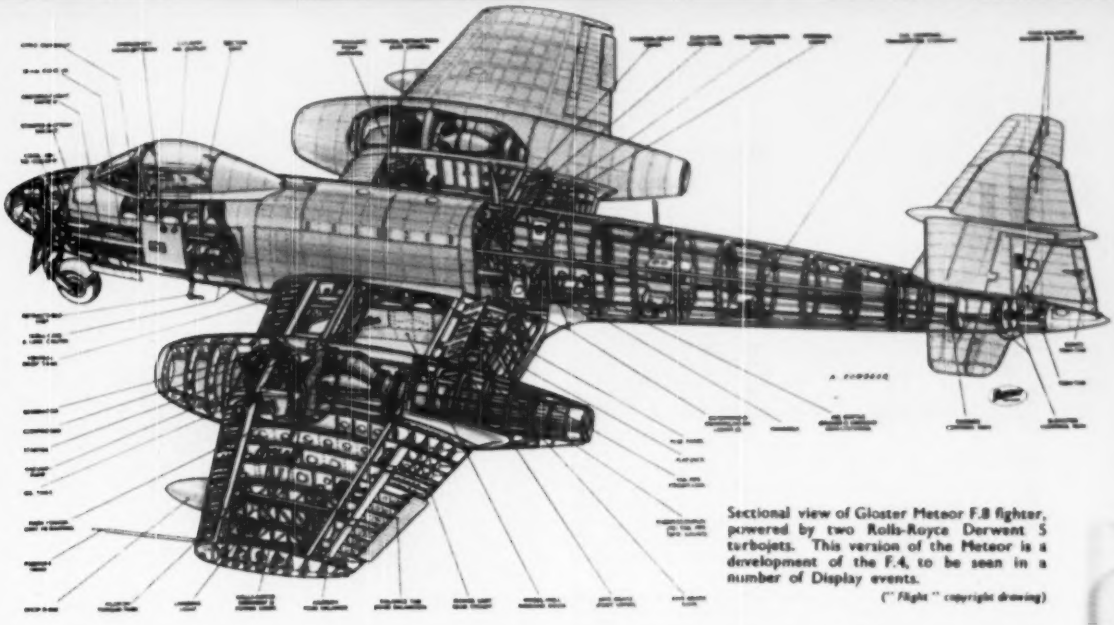


Hawker Typhoon.



Bristol Beaufighter.





Sectional view of Gloster Meteor F.8 fighter, powered by two Rolls-Royce Derwent 5 turbojets. This version of the Meteor is a development of the F.4, to be seen in a number of Display events.

("Flight" copyright drawing)

de Havilland Mosquito N.F.36.

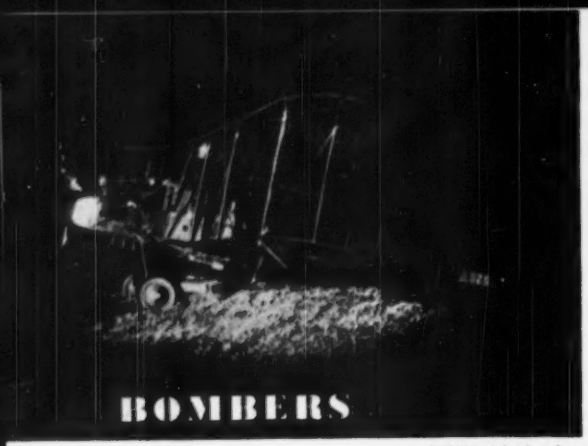
de Havilland Hornet F.3.

de Havilland Vampire with mixed bomb and rocket projectile load.

Gloster Meteor and de Havilland Vampire (and, for that matter, the bulk of jet units in world service) are based on the pioneer work of A. Cdre. Sir Frank Whittle, an ex-R.A.F. cadet. In affording extreme performance the turbojet shows up to particular advantage in a fighter, but it must be admitted that fuel consumption continues higher than could be desired.

Though the Gloster Meteor was in action against ground targets on the Continent and against flying bombs over this country, neither it, nor the de Havilland Vampire, were able to get to grips with the enemy before the war ended. But we have already given some intimation of the qualities of these two great British fighters and the reader may judge for himself by paying his gate money at Farnborough this week-end. He will not be disillusioned.

de Havilland Vampire F.5.B.



BOMBERS

F.E.2B night bomber.

IT would be satisfying to be able to write that the equipment of Bomber Command is equal in quality to that of Fighter Command, just described; but such a claim would be far from the truth. Before glancing back at the bombers which have served the R.A.F. so well in years gone by, it seems appropriate, therefore, to examine present equipment.

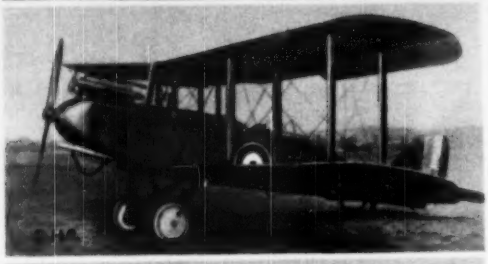
The core of Bomber Command is a small force of four-engined Avro Lancasters and Lincolns, with a few twin-engined D.H. Mosquitoes responsible for target-marking. The Lancaster will always be remembered as one of the greatest bombing aircraft of all time—in the estimation of many people well qualified to judge, the greatest of all. Together with the Handley Page Halifax, it bore the burden of the Bomber Command offensive against German-occupied Europe in the middle and late phases of the war; but to-day it is virtually obsolete.

Though having a higher performance, longer range and heavier armament, the later Lincoln fills the same basic formula. It is too slow, has too low a ceiling, and too short a range for present needs; in the absence of pressurizing, moreover, crew comfort at high altitude is of a relatively low order.

These observations are certainly no reflection on the Avro Company, for, with the Lincoln, they met wartime Air Ministry requirements in their traditional workmanlike way; nevertheless, the Lincoln is undeniably inferior to American and Russian piston-engined bombers, and so it must be superseded.

The boldly conceived four-jet bombers, prototypes of which are now being constructed, will not be ready for service for some years, and the remarkable twin-jet English Electric Canberra, of which more will be said later, is not expected in service

D.H.4.



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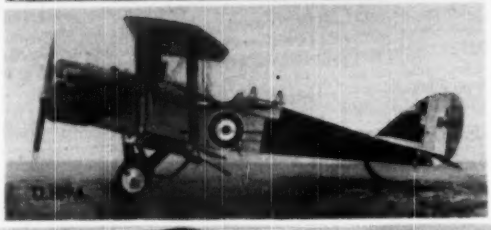
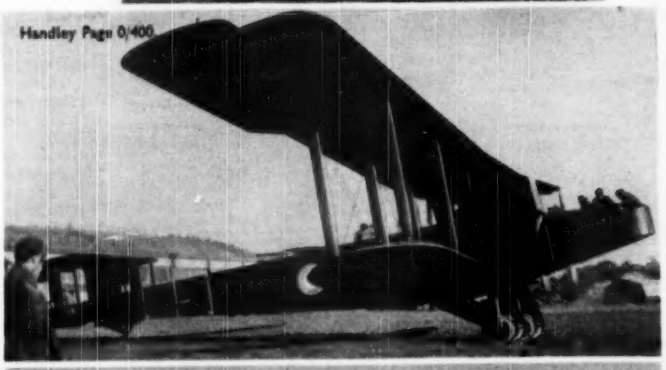


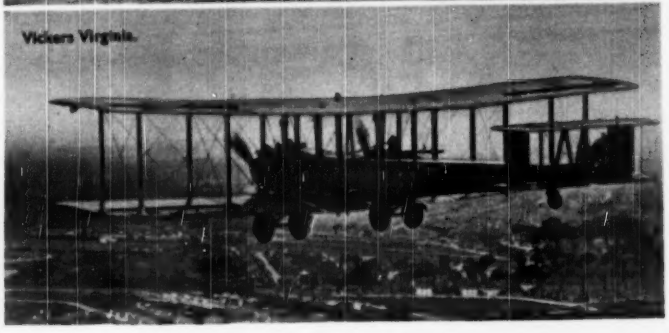
D.H.4.



Handley Page O/400.

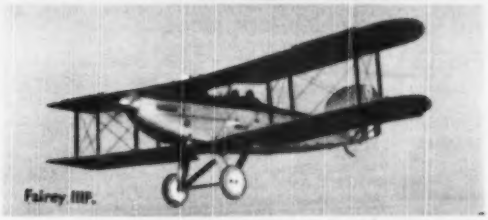
Fairey III.F.

D.H.10C.

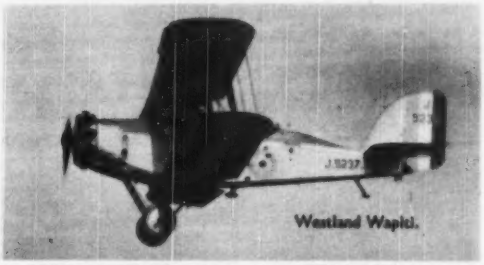


Vickers Virginia.

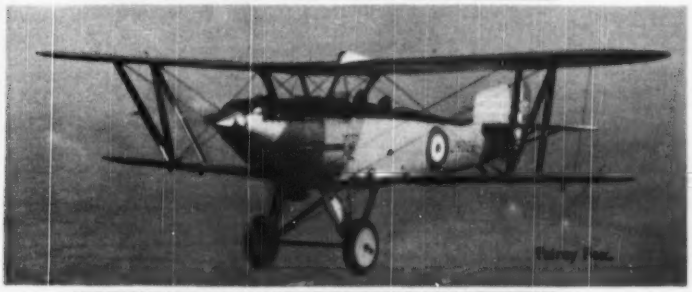
Handley Page Hyderabad.



Fairey IIIF.

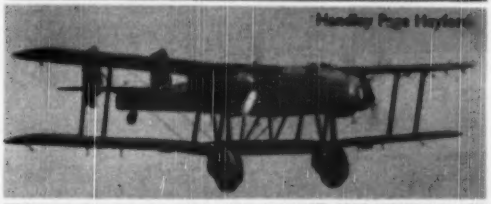


Westland Wapiti.



Fairey Fox.

Bristol Pail Overscout.



Handley Page Hyderabad.

Handley Page Hyderabad.

Fairey Hendon.

Vickers Vincent.

in appreciable quantities for several months. In any case, the Canberra is a relatively small type. Therefore we are receiving from America (with sincere gratitude, but with deep regret at being unable to meet our own immediate needs), seventy or more Boeing B-29 Superfortresses. The B-29 is itself of wartime design, but it is a considerable advance on the Lincoln, especially as the crew compartments are pressurized. Though the maximum bomb load of about 10 tons is no more than the Lincoln's, it will carry this load for a greater distance.

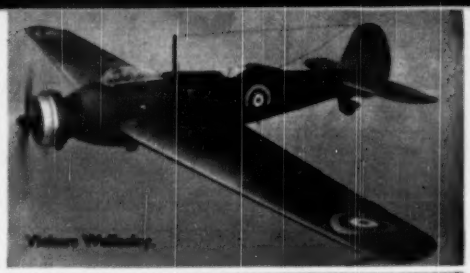
The performance of the graceful, amazingly manœuvrable Canberra, with its two Rolls-Royce Avon axial-flow turbo-jets, may not yet be disclosed, but the type is evidently much faster, and has a better rate of climb, than some jet fighters, and judging from the dimensions of its bomb cell, will carry a really worth-while load. In addition to having a large internal fuel capacity, the Canberra has provision for auxiliary tanks mounted at the extremities of the wings. As the type is not yet in service, it would be inappropriate to discuss it at length in this review, but the reader is invited to compare the photograph of this bomber, appearing on an earlier page, with those of old-time British machines reproduced here. Never has the Service looked forward with such eagerness to a new type, and never was a new type so sorely needed.

It is not, perhaps, generally realized that comfort in the Canberra is of a much higher order than in any existing bombers, notwithstanding the fact that the crew are unable to move about in the fuselage. Due to its speed, the Canberra can complete a sortie in perhaps half the time taken by a Lincoln, thereby lessening fatigue. The cabin is pressurized and, in the words of the A.O.C.-in-C., Bomber Command: "Flying in the Canberra is like sitting at home by your fire, with no vibration, no noise or fuss—no nothing. By comparison the Lincoln is like a noisy, popular, public bar on pay-night."

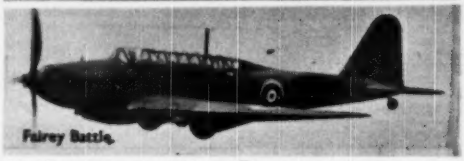
As with fighters, we find that at the beginning of the First World War no specialist bombers existed, and such bombing as was undertaken (the first recorded instances occurred during the retreat from Mons) was from single-engined reconnaissance machines. At first the bombs were of grenade type, or petrol-filled, and were hand-released without any sighting aid; but bomb carriers (generally miscalled "racks"), under the wings or fuselage were gradually adopted as heavier bombs—20 lb or more in weight—became available. The first bomb sights restricted the bomb-aimer to a sighting run directly into or down wind, but sights likewise gained greatly in efficiency as the war progressed.

Not all the early bombers were multi-seaters: the Beardmore-engined Martinsyde G.100 Elephant, for instance, although originally intended as a "scout," operated in the Battle of the Somme with a single 112-lb bomb on an under-fuselage carrier. The first type which seems to have warranted the specific appellation of "night bomber" was another fighter conversion—the F.E.2b. Mention has already been made of the "Fee" in its original fighter

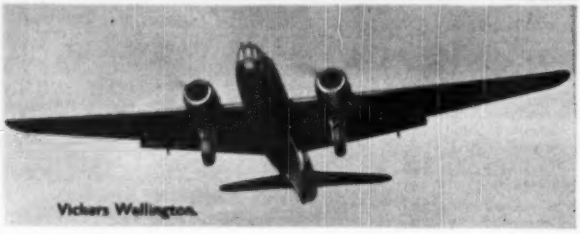
Hawker Hart.



Vickers Wellesley.



Fairey Battle.



Vickers Wellington.

Armstrong Whitworth Whitley.

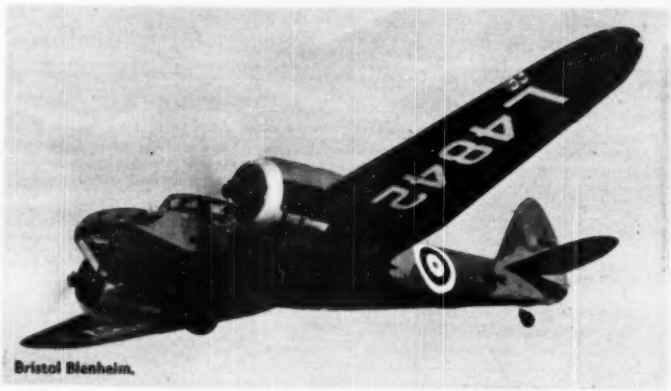
BOMBERS . . .

form; as a bomber it carried a single 112-pounder or four 25-pounders—loads which it frequently deposited in the hours of darkness on dumps, railheads and troop concentrations. It was willing, gentle and long-suffering. Should the 120 h.p. Beardmore engine (or, in the case of the later F.E.2d, the 250 h.p. Rolls-Royce Eagle) cease to drive the churning four-blade pusher propeller at the rear of the nacelle, this grandmotherly old bomber could be set down in a meadow, though the hazards of this undertaking by night, with only primitive aids, are obvious enough.

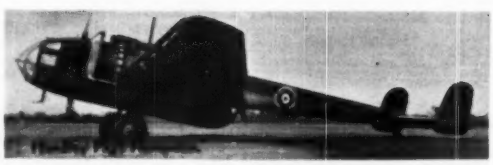
The first specially designed day-bomber to achieve fame was the D.H.4, introduced early in 1917 and approaching in speed the best single-seat fighters of its day, especially when powered with the Rolls-Royce Eagle 12-cylinder engine. Armed with a fixed Vickers and a free Lewis gun, this handsome machine, forerunner of the D.H.9 and 9a, operated without escort. The D.H.9a was generally similar, but the cockpits were brought close together and the American-designed Liberty engine was installed. Overseas and Auxiliary squadrons were still using "Nine Acks" in the early 1930's.

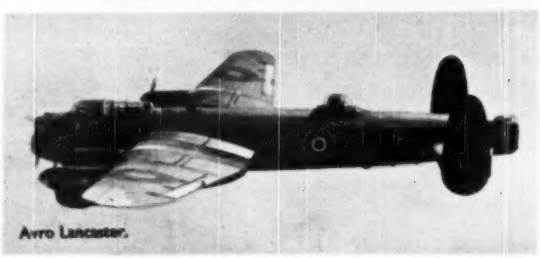
Earliest—and certainly one of the most famous—of the really large bombers was the Handley Page O/400 (the "Bloody Paralyser"), with two Rolls-Royce Eagle engines, 1,800-lb bomb load and four machine guns. Sixteen 112-lb bombs were stowed internally, suspended by their noses as in the German Heinkel 111 bomber of the Second World War. Big brother to the O/400 was the later V/1500, with four Eagles, which flew in May, 1918. This was a real giant, having a span of 126ft, and was designed with the utmost secrecy in Iceland. Three machines of the type were ready to bomb Berlin when the war ended.

These pioneer heavy bombers were followed in R.A.F. service by a series of Handley Pages hardly less distinguished. There was the Lion-engined Hyderabad of 1923, faster than its predecessors, with a speed of 110 m.p.h.; the Hinaidi—a development with Jupiter radial engines; and the Heyford of 1931, of totally new, and highly original, design. The Heyford was capable of over 140 m.p.h., had three gun positions (including a retractable "dustbin" turret) and carried its bombs in the distended centre-section of the lower wing. It was one of the last British biplane bombers and was succeeded by the Harrow high-wing mono-

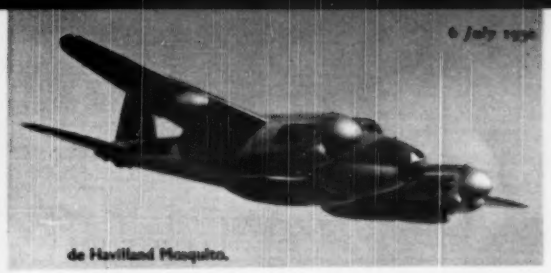


Bristol Blenheim.

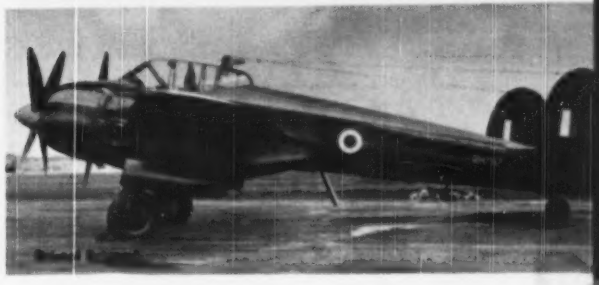




Avro Lancaster.



de Havilland Mosquito.



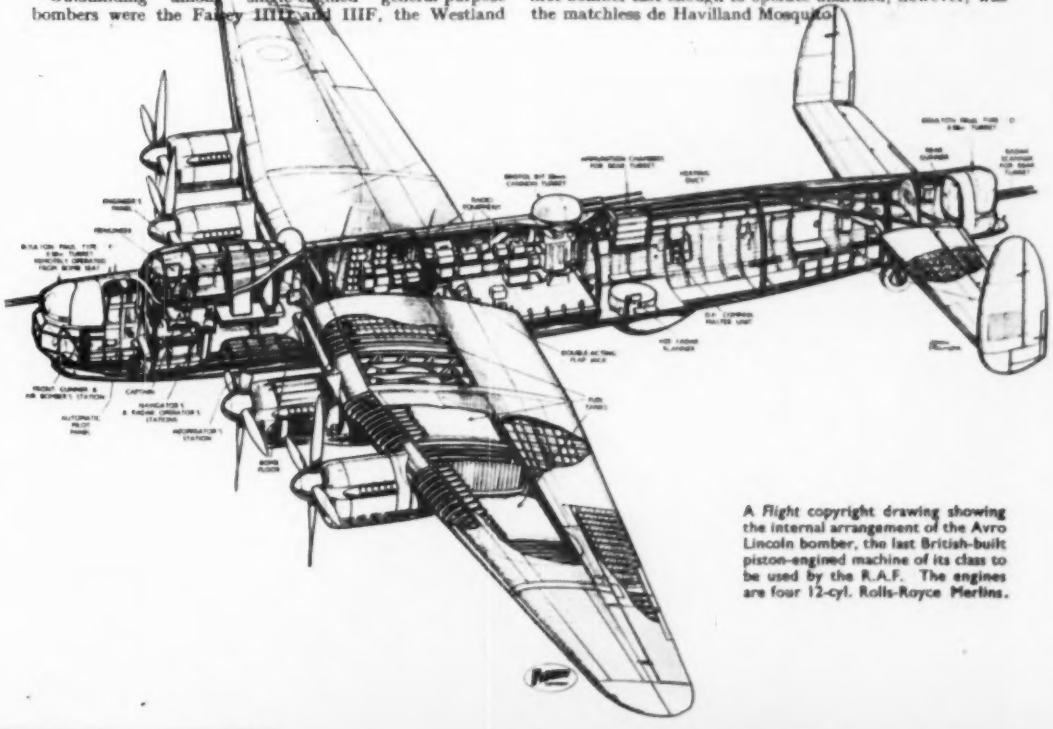
plane, which is a very robust and capacious machine.

In 1936 there followed the prototype of what was to become the Hampden, a mid-wing monoplane of extremely fine lines and having for its main fuselage a structure which has been likened to a suitcase placed on edge. The speed was 254 m.p.h.; the range, 1,460 miles; and the operational ceiling, 15,000ft. Hampdens attacked many parts of Germany in the early phases of the war, and later operated as torpedo-bombers and mine-layers. The illustrious Halifax followed twenty-four years after the O/400.

The 1914 war saw the appearance of two excellent twin-engined bombers—the D.H.10 and Vickers Vimy—which, were too late for operations; but though de Havilland had no other bomber in service until the historic Mosquito, Vickers persisted with their "heavies," the most famous of which was the Virginia. The "Jinny" was one of the best loved of all big bombers; as, of course, was the stalwart Wellington ("Wimpey").

Outstanding among single-engined general-purpose bombers were the Fairey IIIF and IIIF, the Westland Wapiti and Wallace, and the Vickers Vincent and Wellesley. The official predilection for "general purpose" designs proved prejudicial to performance, and when the Fairey company proved, with its beautiful Fox biplane of 1926, that it was possible for a bomber to show a clean pair of heels to contemporary fighters, they set a new fashion. The no less beautiful Hawker Hart served as the basis for nine or more variants, including the more powerful Hind. Faireys continued their bomber tradition with the Battle.

Like the Short firm, who, with their massive Stirling made a magnificent contribution to Bomber Command's wartime effort, Boulton Paul made their mark in the bomber field with a single basic design, for the outstanding and manœuvrable Sidestrand and Overstrand were very closely related. The excellent combination of speed, manœuvrability and armament which characterized these machines was perpetuated in the historic Bristol Blenheim which, as previously noted, served also as a fighter. The first bomber fast enough to operate unarmed, however, was the matchless de Havilland Mosquito.



A *Flight* copyright drawing showing the internal arrangement of the Avro Lincoln bomber, the last British-built piston-engined machine of its class to be used by the R.A.F. The engines are four 12-cyl. Rolls-Royce Merlins.

An R.E.8 Corps-reconnaissance aircraft, with 160 h.p. R.A.F.4A engine. The butt of many jokes, the "Harry Tate" did a fine job.

Armstrong Whitworth Atlas army co-operation aircraft (Jaguar) picking up a message. Later "A.C." types were Hector and Lysander.

FIGHTING STOCK . . .

OTHER CLASSES

ARTICLES in this issue emphasize the importance of many classes of Service aircraft other than fighters and bombers. A well-balanced air force—such as the R.A.F. after its post-war "run-down" now aspires to become—must have reconnaissance aircraft for land and over-water operation; suitable machines for locating and attacking shipping—especially submarines—transports, communications aircraft, and, of course, trainers.

That reconnaissance was among the first applications of British military aircraft has already been noted. The work of such types as the B.E.2c, R.E.8 and Bristol Fighter, as the eyes of the Army and Air Force in the 1914-18 war, is less known than the exploits of the fighters and the bombers of those days; but it had a profound effect on the conduct of the great campaigns and was often nothing short of heroic. Between the wars a special class of two-seater "army co-operation" aircraft came into being and is represented by the Armstrong Whitworth Atlas and Hawker Audax and Hector biplanes, and—last of the line—the Westland Lysander monoplane. The Second World War showed that for tactical reconnaissance a fast single-seater of fighter type was preferable.

For long-range (strategical) reconnaissance the Service still depends largely on the Supermarine Spitfire and de Havilland Mosquito. The Mosquito P.R.34 achieves a still-air range, at 20,000ft, of 3,000 miles, and is capable of operating at heights far above 30,000ft. It may be that the P.R. Mosquito will be superseded by a version of the jet-propelled Canberra bomber.

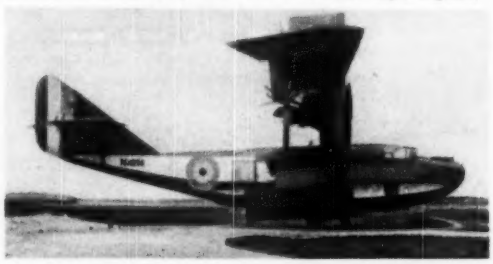
For locating and attacking shipping and for open-sea patrol, Coastal Command is equipped with Avro Lancaster landplanes and Short Sunderland 5 flying boats. The Lancaster is due to be superseded by the Shackleton G.R.1—another Avro product—powered with four Rolls-Royce Griffon engines, equipped with the latest radar equipment, and armed with the most effective anti-shipping—especially anti-submarine—weapons.

Since 1917 excellent use has been made of flying boats for reconnaissance and anti-shipping work. In the construction of this class of aircraft our country has always excelled. The wooden-hulled F.2A of 1917 was built by Short Brothers, had a five-hour endurance, and carried a crew of four. It gave wonderful service on operations

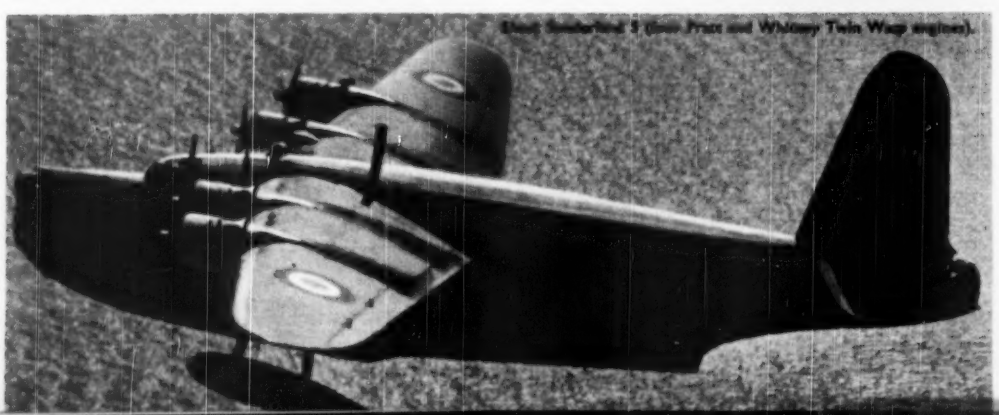
Vickers Vildebeest torpedo bomber, powered with a Bristol Pegasus.

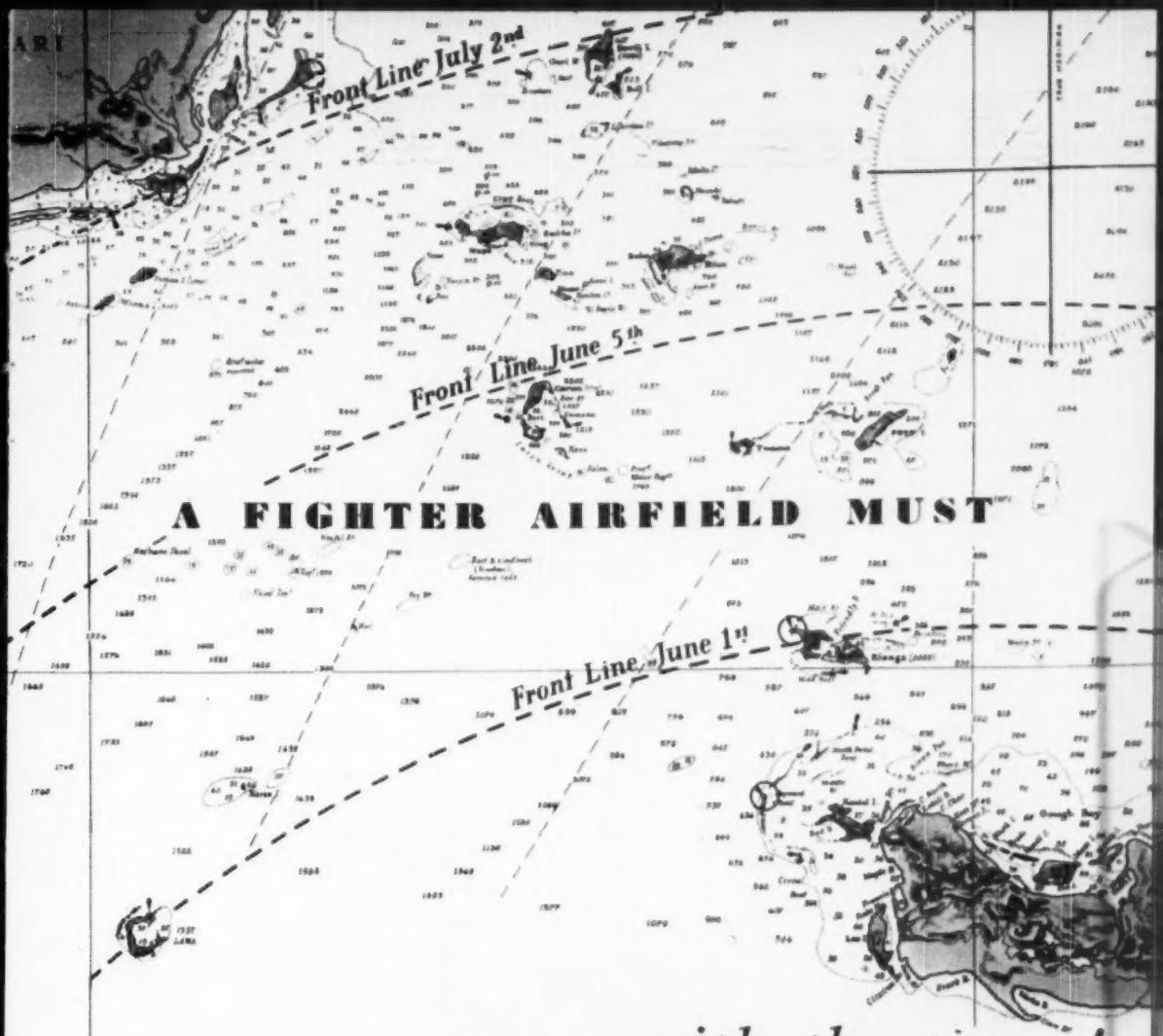
Blackburn Iris flying boat, with three Rolls-Royce Condor engines.

(Below) F.3 flying boat, with two Rolls-Royce Eagle engines.



Short Sunderland 5 (four Pratt and Whitney Twin Wasp engines).





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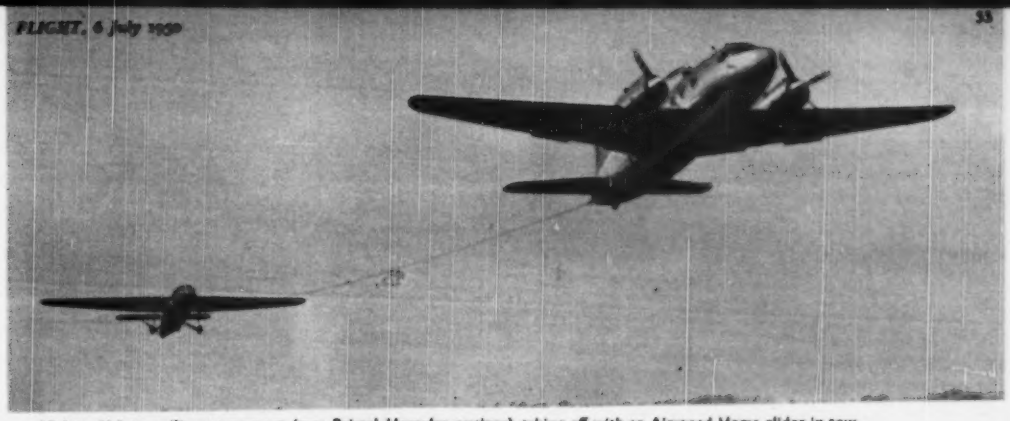
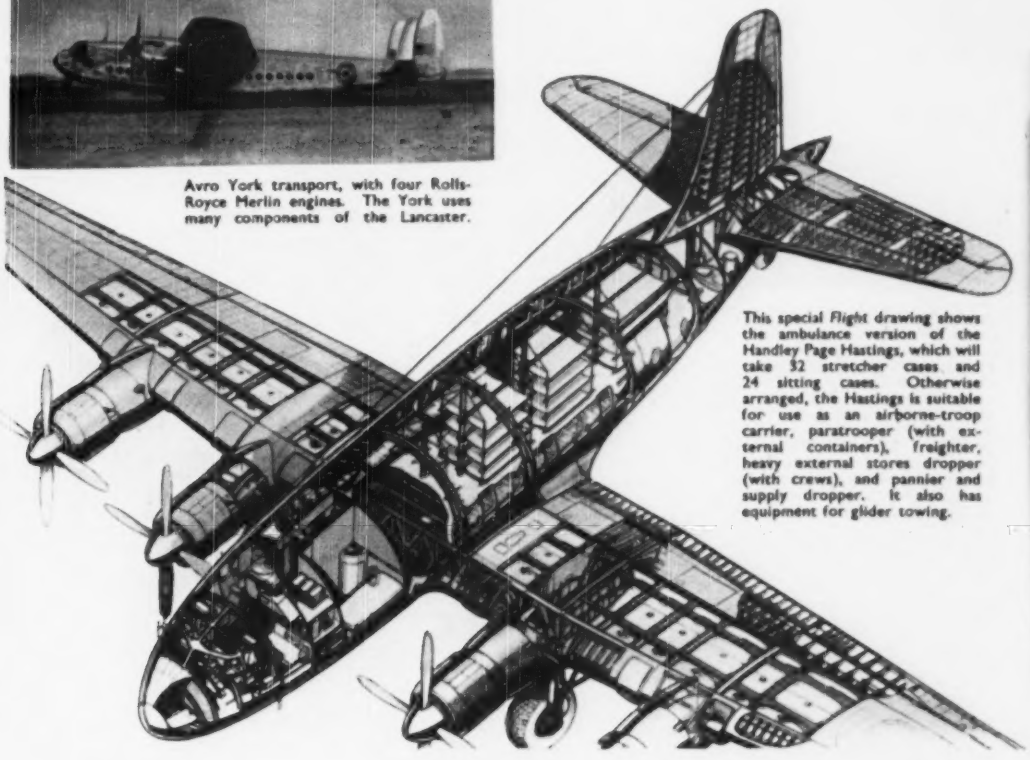


Vickers Valetta military transport (two Bristol Hercules engines) taking off with an Airspeed Horsa glider in tow.

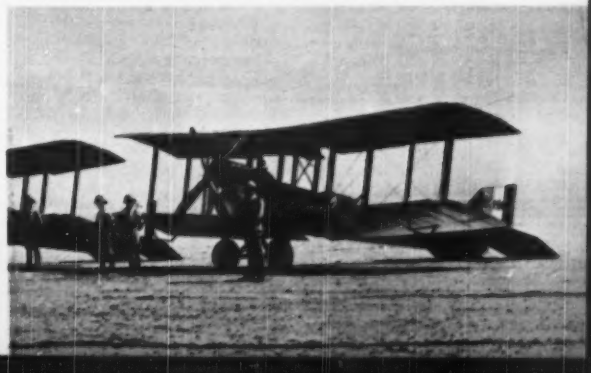
Avro York transport, with four Rolls-Royce Merlin engines. The York uses many components of the Lancaster.

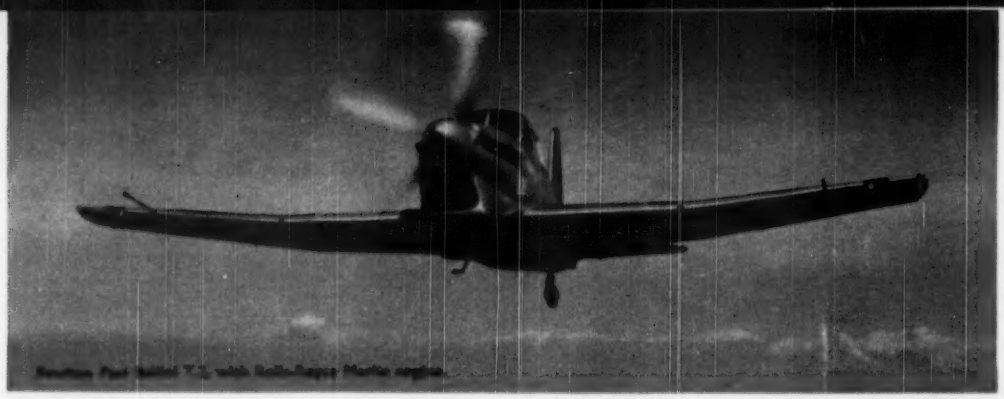


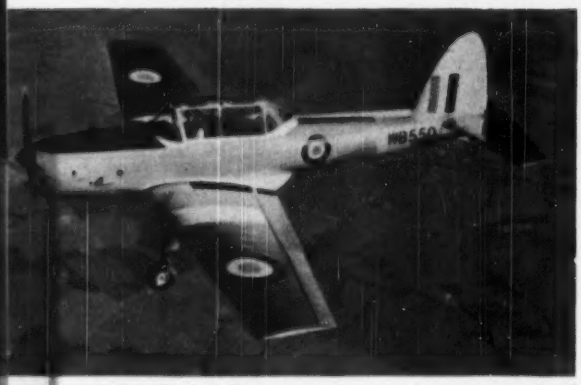
This special *Flight* drawing shows the ambulance version of the Handley Page Hastings, which will take 32 stretcher cases and 24 sitting cases. Otherwise arranged, the Hastings is suitable for use as an airborne-troop carrier, paratrooper (with external containers), freighter, heavy external stores dropper (with crews), and pannier and supply dropper. It also has equipment for glider towing.

The Avro 504K was probably the world's most famous training aircraft. A later development (504N) had an Armstrong Siddeley Lynx.

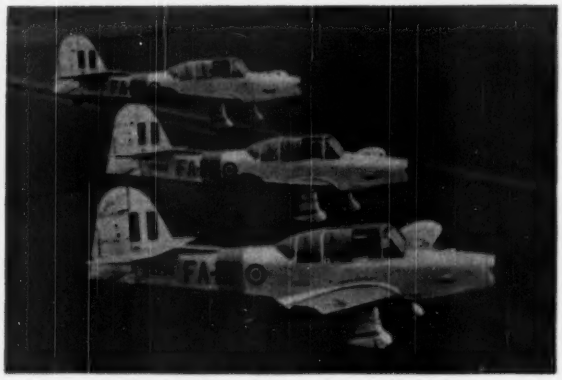
The D.H.6 trainer, otherwise known as "Clutching Hand" or "Sky Hook." Note that the elevators touch the ground.







The de Havilland Chipmunk, as shown, now equips many units of the R.A.F. Volunteer Reserve and University Air Squadrons.



The most widely used R.A.F. trainer is the economical Percival Prentice, with Gipsy Queen engine. A Cranwell flight is seen

OTHER CLASSES . . .

from coastal bases of the R.N.A.S. Hardly less famous was the Southampton, built by Supermarine, which concern was also responsible for the Scapa and Stranraer, and, later, the small, versatile Walrus and Sea Otter amphibians. The Blackburn Company, with their majestic Iris and Perth boats, also made their mark, but to-day only the Short Sunderland remains, and no replacement for this magnificent veteran has been announced. The Sunderland was first taken into service in 1938, but the present Mk. 5 version has been greatly developed.

It is saddening to report that no special anti-shipping squadrons exist to-day in Coastal Command, though in the past torpedo-bomber aircraft such as the Hawker Horsley, Vickers Vildebeest and the Bristol Beaufort and Beaufighter, have served the R.A.F. with great distinction. With rockets, guns and bombs the Mosquito, also, made a great name for itself in Coastal Command service.

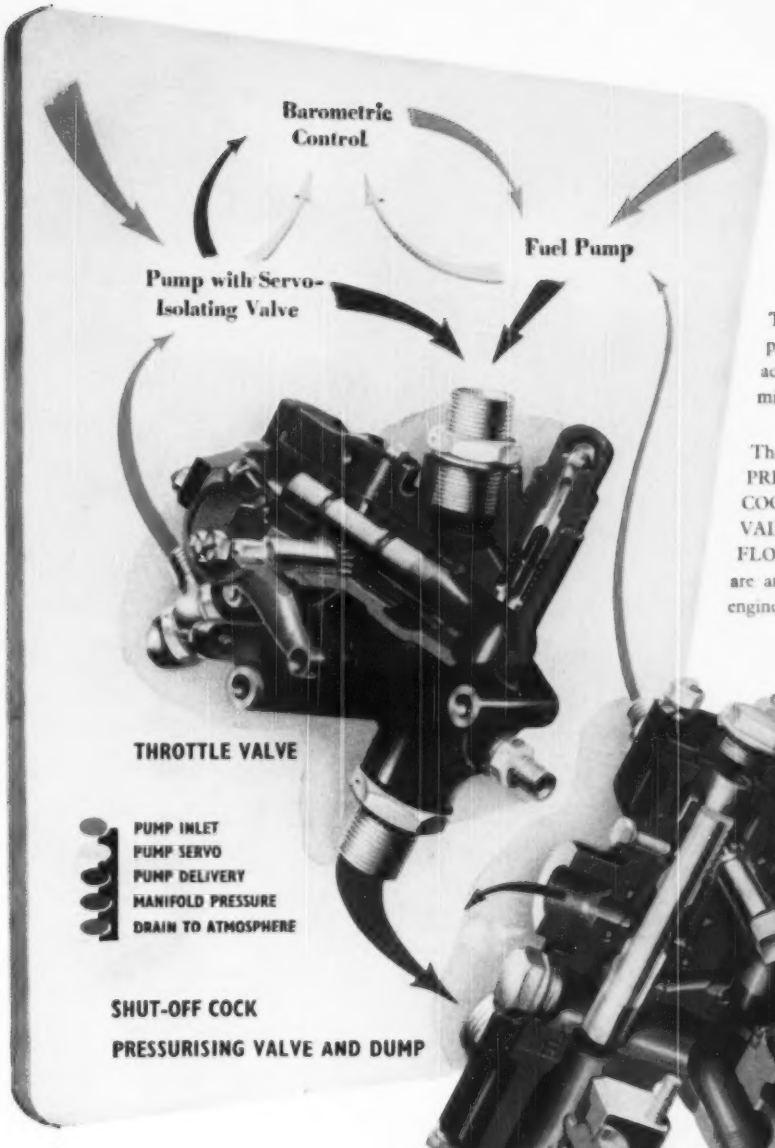
In the 1914-18 war the specialized military transport aircraft was unknown, but in post-1918 overseas operations the R.A.F. put the capacious Vickers Vernon, Victoria and Valentia to excellent use. During the Afghanistan rising, Napier Lion-engined Victorias were used in the historic evacuation, from Kabul, of the British Minister and the civilian population. Eighty-three journeys were necessary. To-day the name of Vickers is linked with the twin-Hercules Valetta, which weighs 36,500 lb and has a maximum speed of 294 m.p.h. at 5,500ft. The Valetta is closely related to the Viking (primarily a civil type but also been accorded the distinction of equipping the King's Flight of the R.A.F.), and was introduced to replace the Dakota. Simultaneously the larger Handley Page Hastings began to succeed the Avro York, though the York, and, for that matter, the "Dak" also, continues in service.

Training aircraft now generally used by the R.A.F. are the de Havilland Tiger Moth (D.H. Gipsy Major engine), Percival Prentice T.1 (D.H. Gipsy Queen), North American Harvard (Pratt and Whitney Wasp), Gloster Meteor 7 (two Rolls-Royce Derwent 5 turbojets), Avro Anson (two Armstrong Siddeley Cheetah), Mosquito T.3 (two Rolls-Royce Merlin), Bristol Buckmaster T.1 (two Bristol Centaurus), and Vickers-Armstrongs Wellington T.10 (two Bristol Hercules). De Havilland Chipmunk monoplanes, with Gipsy Major engines, are replacing the Tiger Moth biplanes in units of the R.A.F. Volunteer Reserve. All the machines here mentioned (except the Harvard, which is an ageing, and remarkably efficient, American) are in the best British trainer tradition, carried on since the classic Avro 504, by such types as the Avro Tutor and Miles Magister, and Master.

The latest trainer to be adopted (in replacement of the Harvard) is the Boulton Paul Balliol T.2. This extremely manœuvrable side-by-side two-seater is now in full production. To the same specification the Avro company built their Athena, and a number of these fine machines are to be used by the R.A.F. Flying College at Manby.

Our review must conclude with mention of communications aircraft, including the Auster (used also by Army pilots, as an "air observation post"), Airspeed Oxford, Percival Proctor and de Havilland Devon; the air/sea rescue machines, typified by the Lancaster and Sea Otter; meteorological reconnaissance aircraft, e.g., the Halifax; and target-towers, represented by special versions of the Beaufighter and Tempest, and the Miles Martinet. All have their place in a great Service.

Dragonfly is the Service name for the Westland-Sikorsky S-51 helicopter (Alvis Leonides engine)—truly a "maid of all work."



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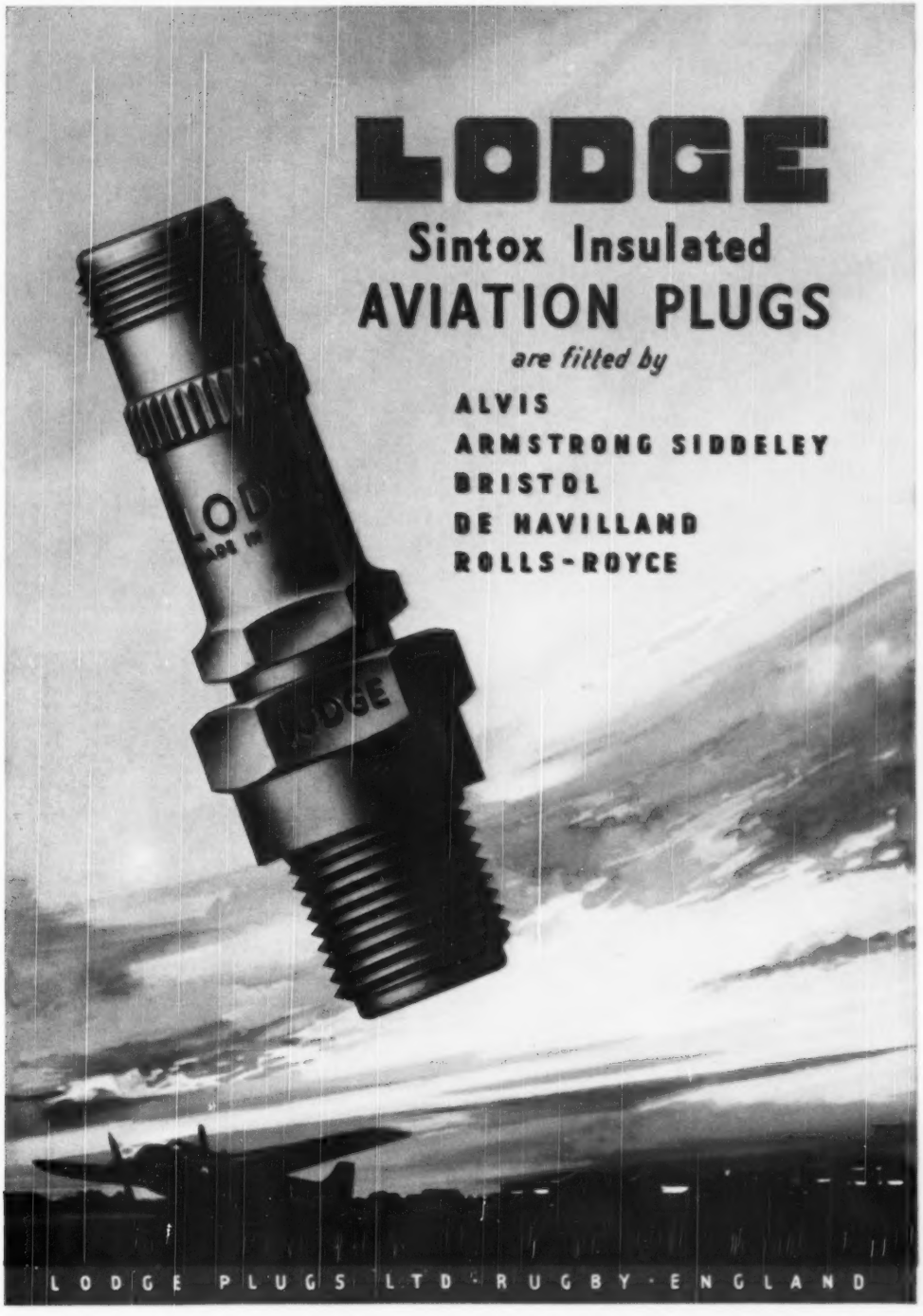
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FAR EAST AIR FORCE (Continued from page 34)

fields at Negombo and a flying boat base at China Bay, Trincomalee. On the north-east is Hong Kong, with its combined airfield and flying boat base at Kai Tak, on the mainland of China opposite Hong Kong, and a landing strip at Sek Kong in the New Territories near the border.

In the centre is A.H.Q. Malaya and R.A.F. Maintenance Base (Far East) Seletar, with its storage sheds and workshops, both on the island of Singapore. Under the former are two airfields in Singapore (Changi and Tengah), two in Malaya (Kuala Lumpur and Butterworth) and the flying boat base at Seletar on the Straits of Johore.

Aircraft of the Far East Air Force range from Sunderland flying boats, through Dakotas, Brigands and Mosquitoes, to Spitfires and Tempests. The last remaining Beaufighter squadron in the Royal Air Force very recently converted to Brigands.

The primary task of the Far East Air Force is the internal security of the area and the protection of British and Commonwealth interests; closely related is the training of officers, airmen and airwomen necessary for these duties. At the present moment, the first objective is represented by the campaign against the Communist guerillas in Malaya, in support of the civil power and in close co-operation with the other Services and the Malay Police. The contribution of the Far East Air Force to the campaign is threefold in character: offensive air strikes, air supply, and photographic reconnaissance. There is no state in Malaya in which, at some time or other, Spitfires, Tempests, Brigands and (formerly) Beaufighters have not attacked bandit encampments, hide-outs or similar targets, with rockets, bombs and machine guns.

Some of these targets are mere pin-points, such as *atap* huts, in remote districts. On several occasions, however, buildings near to towns have been attacked effectively and accurately. Such a special strike was launched in September, 1949, on the outskirts of Kuala Lumpur, when two previously selected huts were picked off without damage to those adjoining. Other targets are simply wide areas of jungle where bandits are known to be in hiding or to have concentrated, and where strafing by machine-gun fire or rockets causes their rapid dispersal in disorder.

Supply Dropping

Possibly the greatest contribution to the campaign is the supply by air of the ground forces. Jungle patrols must necessarily travel light; five days is their normal limit if supplies cannot be replenished. But para-packs dropped by Dakotas enable them to remain on the spot, keeping the bandits on the run without respite and chance to re-organize.

There is no State in Malaya where supplies have not been delivered by Dakotas on dropping zones of all kinds—wide river beds, uneven hillsides, clearings little bigger than tennis courts—and all with negligible loss. Since the beginning of the campaign over two and a half million pounds of supplies have been successfully dropped to British, Gurkha and Malaya troops and police operating throughout the Federation. In addition, the Dakotas have transported troops and reinforcements from one airfield of Malaya to another, and have dropped in bandit-infested areas millions of leaflets giving details of Government surrender terms.

Aerial photography has in the course of the campaign increased by over 500 per cent; it is mainly carried out by P.R. Spitfires. Five-sixths of Malaya is covered by jungle, and existing maps of this five-sixths leave something to be desired. Every day, an average of one thousand prints is turned out, not only for use in detecting air-strike targets, but to assist ground forces in their movements.

A task on which the Far East Air Force has been engaged for the last two years is an extensive photographic survey of British countries in South East Asia to meet the requirements of the Colonial Office and other Government departments. In recent years, a total of 200,000 square miles has been photographed by Mosquitoes in British North Borneo, Sarawak, Malaya and elsewhere. The completion of this task is materially affected by annual monsoon conditions. The current programme calls for the survey of a further 150,000 square miles of territory, mostly over Malaya.

Apart from the anti-bandit campaign, the protection of British and Commonwealth interests elsewhere in South East Asia has in recent years also taken the form of the evacuation of British and kindred nationals from Rangoon, in 1948, and Shanghai in 1949. The possibility of the recurrence of this commitment has always to be borne in mind.

An operational requirement included in the main task of promoting the internal security of the area controlled by the Far East Air Force is the maintenance of the air routes between the flanks and centre. Dakota Squadrons are unceasingly engaged on this task, for which a Flight of No. 41 Transport Squadron, R.N.Z.A.F., has been lent by the New Zealand Government. Three times a week, scheduled services fly between Singapore and Kai Tak, refuelling at Saigon in Indo-China under agreement with the French Air Force in the Far East. During the last six months more than 750 passengers and over 140,000 lb of freight have been handled on this route alone.

In the western section of the Command, medium-range aircraft flying between Malaya and Ceylon refuel at the small island of Car Nicobar in the Bay of Bengal, 600 miles from Butterworth in north-west Malaya and 250 miles from the northern tip of Sumatra. Other scheduled services also operate regularly between Singapore and the R.A.F. stations of Kuala Lumpur and Butterworth in Malaya. There is another between Singapore and the island of Labuan off the west coast of Brunei, where an R.A.F. Signals Detachment has been established to assist both Service and civil aircraft.

Training Exercises

Apart from operations in Malaya, training is the major preoccupation of most of the flying units in the Far East Air Force; exercises, maritime and otherwise with the three Services, are a regular feature throughout the Command, and more especially at Hong Kong.

Long-range flights for aircraft of all kinds frequently take place. In February, two Sunderlands from Hong Kong flew to Fiji by way of Darwin and Auckland to join a flying boat Squadron of the Royal New Zealand Air Force for two months, and were replaced by two R.N.Z.A.F. Catalinas. In October of last year, Tempests flew to Hong Kong from Singapore, returning the following month, when refuelling stops were made at Butterworth, Saigon and Tourane. Brigands have also flown to Ceylon *via* Car Nicobar.

A departure from the Air Ministry policy that, in general, no training unit will be maintained abroad and that training beyond the capacity of units will be undertaken by individuals at courses in the United Kingdom is to be found in the specially established Instrument Weather Training Unit at Seletar, for the instrument rating of pilots, and in the Armament Practice Camp at Butterworth.

Other flying activities of the Far East Air Force include daily reconnaissance for meteorological reporting and forecasting by aircraft based at Negombo and Singapore. There are, in addition, four Auster-equipped A.O.P. flights—three based in Malaya, one at Hong Kong—engaged on their routine duties of reconnaissance, communication flights, artillery spotting, and providing an R/T link with operating ground forces.

The signals organization of the widely dispersed Far East Air Force is, obviously, of especial importance. Hence, the effective operation of radio and radar equipment is a matter of prime concern. A fully equipped Radio Repair Squadron has been set up at Seletar to undertake major repairs.

The need to provide adequate assistance to aircraft on long sea crossings has led to the formation of signals units on the remote islands of Car Nicobar and Labuan. Yet another vital commitment is the inter-Command radio-teleprinter network, with signals centres at Singapore and Colombo linking the Far East with the Middle East and the United Kingdom, and also providing direct radio teleprinter communication with Hong Kong and Australia. An outstanding feature of the Singapore Signals Centre, at Changi, is the number of airwomen-operators—at times amounting to half of the total staff.

The R.A.F. Signals organization continues to provide much technical assistance to civil aviation throughout South East Asia.

A new responsibility of the Far East Air Force is the employment of local populations on local defence duties. The R.A.F. Regiment (Malaya), with a depot and squadrons based in Singapore, Malaya and Hong Kong, has been formed for duties in the defence of airfields. The Malay airmen are showing good promise for the future. Two squadrons are at present operating against the bandits in Malaya.

Recruiting for two Auxiliary Fighter Squadrons, to be based in Singapore and Penang, is about to begin, and a force to be called R.A.F. (Malaya) has been authorized. This will be a full-time locally enlisted force of civilian tradesmen and technicians to be employed as substitutes, wherever possible, for British airmen. In Hong Kong, an Auxiliary Air Force—comprising an auxiliary flight of four Auster aircraft and a Fighter Control Unit—has been formed as an integral part of the Hong Kong Defence Force.

The Badge of the Far East Air Force is a pair of naked *kris* (Malayan daggers) surmounted by a junk, symbolical of that part of the globe where it is employed. Its motto is the one word, "Eastward." Both are well chosen to represent a Command maintaining watch and ward over the lands and waters of one of the most important areas of the world to-day.

MIDDLE EAST AIR FORCE

From Air Marshal Sir John W. Baker, K.C.B., M.C., D.F.C., Commander-in-Chief, Middle East Air Force

THE Middle East Air Force will not be represented in the Display, but everybody in this Command is with you at Farnborough in spirit. Most officers and men of the Royal Air Force serve at some time or other in the Middle East and know something of the vast extent, the varying climate, and the complexity of day-to-day problems that face us in our work. From Malta to Mauripur, from Cyprus to Nairobi and over all the intervening staging posts and landing grounds the Command is once again established for its peacetime duties as in the years between the wars.

Many of our colleagues who have now left the Air Force will remember their service in Egypt, Malta, Aden, and Iraq, and will be glad to know that a number of the old squadrons are continuing those watch and ward duties in the areas we knew so well.

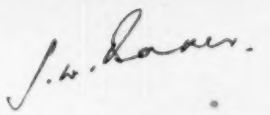
Fundamentally, our responsibilities remain much as we remember them previously, but, with the air force now in the van of the defence services, they are enlarged both in scope and in degree. Malta now controls the stations and staging posts along the North African coast: Iraq extends from Jordan down the Persian Gulf to Mauripur: Aden looks after the airfields along the South Arabian coast and covers Somaliland as well as the Red Sea up to Permi and Kamaran: 205 Group takes in Cyprus with the Canal Zone and links through the Sudan with a new peacetime Headquarters in East Africa at Nairobi.

To administer so large a Command and ensure that the Service can meet its obligations to all the countries and colonies we are here to defend, a far larger and more complex organization is necessary than was needed in those pre-war days.

Apart from the operational squadrons, we have many more transport squadrons; units of the R.A.F. Regiment as well as the deservedly famous levy forces in Iraq and Aden; marine sections; and all the elements for signals, administration, servicing and supply—many of which have been added to or enlarged to meet the new conditions.

I know you will be glad that I can record how all ranks serving in the Middle East to-day, women now as well as men, are accepting these responsibilities at a standard of efficiency and enthusiasm of which we can all indeed be proud.

We are well aware of the great tradition of overseas service which lies behind us: and we are ready to meet whatever emergency the future may hold in the same spirit of confidence, determination and resource which the Royal Air Force has made so particularly its own.



LONGITUDE 10 deg W. to 90 deg E., latitude 40 deg N. to 20 deg S.—half a world of desert, jungle, mountain, water. So would run Middle East Air Force's area of strategic responsibility in time of war, over three continents from Morocco to the Andaman Islands and from Italy to the borders of South Africa. This vast Command is by far the R.A.F.'s biggest, geographically speaking.

The Navy, Army and Air Force are integrated into a three-pronged organization, with its nerve centre in Egypt's Canal Zone, able effectively to carry out Government policy. The distances involved make a large amount of decentralization imperative if a number of factors, and time-lag in particular, are not to jeopardize operations in an emergency. M.E.A.F. achieves this decentralization through a number of strategically located headquarters, No. 205 Group (Canal Zone), Iraq, British Forces Aden, East Africa and Malta, all of them sub-formations with a separate but closely integrated part in the overall plan.

This strategic conception, naturally, does not mean that R.A.F. forces constantly cover the whole area. In practice, the Command's practical, peacetime responsibility is reduced in scale to extend only within the limits of Malta to Mauripur (Pakistan) and Greece to East Africa. Even so, the distances are enormous, and the key to successful control is a high degree of mobility, as when, in March this year, squadrons were transferred from the Canal Zone and Aden to support the Army in handing over Somaliland to the Italians. Although under the temporary control of A.H.Q., East Africa, these squadrons took all necessary equipment and maintenance crews with them, operating exactly as they would have done in war.

The forces now stationed in the Canal Zone are due to leave when the present treaty expires in 1956, unless an extension of British tenancy is agreed upon. Meanwhile, training and liaison with the Egyptian Forces continue. No. 205 Group, in effect A.H.Q. Canal Zone, has as its primary task the air defence of the Zone. It is actually an operational air force in miniature, consisting of day and night fighters (with their complementary organization for radar facilities and of anti-aircraft units) and tactical and transport forces—all capable of rapid expansion in war. The Group also carries out special assignments of long-range aerial photographic reconnaissance and survey.

Its responsibilities, however, extend outside the Zone over an area which can be compared in size with Western Europe: to Cyprus, where it has jet-fighter aircraft and armament practice ranges, and to Khartoum, where it controls a base with a staging post on the African trunk route. The A.O.C. has under his control 70 per cent of all flying units in M.E.A.F., used when necessary to reinforce other areas under the direction of one C.-in-C.

As a Bomber Command commitment, the Group provides and controls in the Zone the main Middle East training base for air firing and individual training. Every squadron in Bomber Command has now been out to Egypt—some of them twice—on Operation *Sunray*.

Other elements controlled by the Group are the landing strip at Akaba, Jordan's Red Sea port, and a marine-craft base on the shores of the Great Bitter Lake which is the headquarters of craft operating in Cyprus and Aden and at which flying boats alight for servicing or reinforcement flights.

Separated from the Canal Zone by nearly 1,000 miles of desert and hill country and without Army support lies A.H.Q. Iraq, with its model base at Habbaniya housing the air striking forces and R.A.F. Regiment and Levies at the disposal of the A.O.C. to meet the British responsibilities from Jordan across Iraq, to the Persian Gulf of Mauripur, where the Pakistan Government permits a R.A.F. staging post to be maintained. Established after the Air Force evacuated Bagdad in 1933, Habbaniya has been developed out of the desert into a first-class base in all respects.

Even farther from the Canal Zone to the south is H.Q. British Forces Aden, also a purely R.A.F. commitment: again air-striking, R.A.F. Regiment and Levy forces come under the A.O.C. Under its operational command is the territory of the Aden Protectorate and a string of air staging posts along the Southern Arabian coast held by agreements with the local rulers. These posts are vital links in the southern air route to Mauripur and the Far East.

Over to the south-west is East Africa, a link in our air communications southwards from Egypt *via* Khartoum. The H.Q. is at Nairobi, where the A.O.C. is located and acts for the C.-in-C., M.E.A.F., as his representative on the East African Defence Council.

To the north-west is Malta, linked in its turn to the Canal Zone by the staging posts of Castel Benito, Benina and El Adem. It is an "inter-Service" island where both fighter and maritime squadrons are based to share in its defence.

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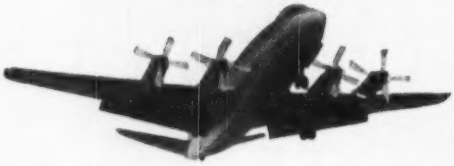

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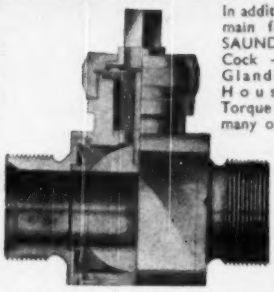

In addition to the three main features of the SAUNDERS S.P. Aero Cock — Full Bore, Glandless Spindle Housing, Low Torque — there are many other advantages which this unique component offers to the aircraft designer :— Impossibility of seizure. Withstands high vacuum, e.g. in oil suction systems. Readily salvaged. The screwed ends are readily replaced. Suitable for gang operation. Low torque simplifies cable and remote control installation. Bodies only, i.e., without screwed ends conveniently build in to many systems. Mark II models are standard in this form.

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Secrecy surrounds the specifications of some of the faster craft but it is of interest to record that as with the slower, heavier, and in some respects less spectacular machines, the various forms of Saunders Cocks are again widely favoured as the following list shows :—Gloster Meteor, de Havilland Vampire and Venom, Hawker, Avro, S.R.A.1, Westland Wyvern.

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Great distances have to be covered; from East Africa's A.H.Q. at Eastleigh (Nairobi) to Malta, for example, is about 3,000 miles. Although decentralization is of high value in a command such as M.E.A.F., to function properly it must have a highly efficient system of communications. The scheduled aircraft services controlled by 205 Group cater for material supplies and personal liaison, but the possibly greater burden of day-to-day, intra-Command contact falls upon the signals service.

Focal point of the transmission and reception of signal messages for the whole of M.E.A.F. is the Middle East Telecommunication Centre in the Canal Zone, which provides a network quite independent of civil or other Service circuits. This is the R.A.F.'s biggest overseas strategic signals centre. Its main circuits include one to England and one to Colombo for onward transmission to Singapore.

Aircraft communication and aids to navigation involve a separate extensive network for which responsibility is shared between the Air Ministry and (because many of the Command's airfields are also used by commercial aircraft) the Ministry of Civil Aviation. While the R.A.F. provides all teleprinters and switchboards—and usually their staffs—the supply and maintenance of the cables is an Army task.

Normal airfield defence and internal security in R.A.F. areas of responsibility are allotted to the R.A.F. Regiment, a highly mobile force often equipped with armoured cars and supplemented by detachments of local levies. Station guard duties, however, fall to non-Regiment N.C.O.s and airmen, again aided in some places by police auxiliaries drawn from the local population together with trained police dogs.

The Regiment's armoured cars, fitted with V.H.F. radio able to maintain contact over long distances with other units and to guide aircraft, sometimes help in the rescue work for which all stations in the Middle East must always be prepared.

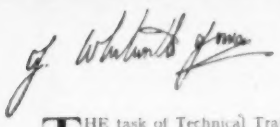
Unlike the home commands, M.E.A.F. combines to a large extent all Air Force roles from primary duties to anti-submarine patrol to close Army support. It follows that its technical services, cut off from Maintenance Command by thousands of miles, must be in great measure self-contained. Necessity translates itself into independent third- and fourth-line servicing—M.E.A.F. recovers its own crashed machines and repairs them if that is possible, in the main relying on Maintenance Command only for replacement of engines and spare parts.

Varying climate brings with it special maintenance problems, while the introduction of jet fighters is now making extra research vital both locally and at home. Cockpit temperatures may climb as high as 146 deg in a Vampire.

The work in M.E.A.F. is shared by the women of the W.R.A.F., represented in the Canal Zone, Aden and Iraq and playing an integral part as wireless operators, clerks, equipment assistants, telephone operators, policewomen and nurses. Their officers are assigned to Administrative, Education, Intelligence, Cypher, Provost, catering and equipment duties.

TECHNICAL TRAINING COMMAND

From Air Marshal Sir John Whitworth Jones, K.C.B., C.B.E., Air Officer Commanding-in-Chief



THOSE who visit the first post-war Royal Air Force Display will recognize that much of what is presented is the cutting-edge of the sword that is the Royal Air Force—the aircrew, and the aircraft with its intricate accessories. They will know that the cutting edge must have behind it the full weight of ground servicing crews and the administrative and logistic personnel, who together keep the aircraft and accessories serviceable, and provide the organization which enables the Higher Command to bring the cutting-edge to bear. It is the task of Technical Training Command to train this weight behind the cutting-edge.

In admiring a modern aircraft one pays tribute to those human qualities which have made its production possible. Similarly, the intricate manœuvres of a Royal Air Force squadron of aircraft are a manifestation of human quality trained to a high pitch of skill.

The aircrew cannot perform efficiently unless they have complete confidence in the ground personnel who service the aircraft and maintain the organization. This quality of mutual confidence between aircrew and ground personnel is vital to the sharpness of the cutting-edge of the Royal Air Force.

Technical Training Command must develop in their trainees those qualities which will command the confidence of the aircrews; qualities such as loyalty, integrity, conscientiousness, determination, endurance and skill. The work of the Command thus focuses to the task of developing fine men and women as described below.

I would ask those who attend the Display not only to look at each event but to look *into* it. They will then glimpse the thing that matters—a manifestation through the air of those qualities of the British character which have shaped our history from Agincourt to Alamein, and the Armada to Arnhem.

THE task of Technical Training Command is, broadly, to train all who enter the R.A.F., with the exception of cadets at the R.A.F. College, Cranwell, Staff students and aircrew trainees. Training includes that of apprentices; boy entrants; regular airmen volunteers; National Service Act airmen; regular volunteer airwomen; officer-cadet training of airmen commissioned from the ranks; training of direct-entry men for limited service commissions; officer training of direct-entry professional men, such as padres and educationalists; training of National Service Act commissioned entrants; and officer training for the Women's Royal Air Force.

The scope of training covers the professional training of Technical, Equipment and Secretarial officers, recruit training, and technical training in a vast field of trades from fitters to cooks. This wide variety of tasks and responsibilities is unified and given purposeful direction by stressing the one vital common factor—the human aspect.

An interesting and important activity is apprentice training, for which entrants must possess certain standards of education and physical fitness. When accepted they are given a three years' general education, in which is incorporated training in the most skilled trades. Some of the best of the apprentices, on completing their training, are granted cadetships to the Royal Air Force College, Cranwell, and so get a further two years' training, at the end of which time they enter active units as commissioned officers. The bulk of the airmen rapidly reach non-commissioned rank, and many receive commissions.

There are many youths who wish to make the R.A.F. a life career but who cannot achieve the educational standards needed for the Apprentice Schools. They are accepted for boy-entrant training and undergo an eighteen months' course of general education incorporating technical training in the lesser skilled trades. It is the aim to convert all those who prove themselves capable to the highest-skilled trades during the two years following the completion of their boy training. Boy entrants are given an opportunity in the early stages of their training to improve their education, and those considered suitable sit a special examination which, if passed, qualifies them for promotion from boy to apprentice training.

The adult regular volunteer is taken into a special reception unit, where he is examined medically and tested to find his natural aptitudes. He may arrive with a very clear idea of the particular trade he wishes to follow. If that trade is filled he is informed of others open for which his talents would seem to suit him.

Modern methods of recruit training are designed to form the man in a balanced manner, giving proper weight to his physical, mental and spiritual development. This need is continuously kept in mind by the officers and N.C.O.s of the G.D., Regiment, and Secretarial branches responsible for the recruits.

During recruit training the benefits from physical instruction are reflected in a noticeable increase in height and weight. In the mental sphere, education and citizenship classes are included in the syllabus, and the arts and crafts are encouraged. In the spiritual sphere the padres of the various denominations conduct "padre's hours" in which the elements of the Christian ethic are developed on the discussion-group principle. The regular volunteer, when he has finished his recruit training, proceeds to his appropriate trade school, where his balanced training continues.

The National Service Act entrant is handled in very much the same way, with the exception that he cannot be given complete freedom of choice of trade. He must do his service and he must fit into the R.A.F. structure. Special efforts are made, however, to fit round pegs into round holes. At each N.S.A. Recruit Training Centre there is a "technical information room" where recruits can see some of the duties and responsibilities of all the trades open to them in the R.A.F. and discuss them with experts. The recruits are gradually led to take an interest in that group of trades for which their original aptitude tests would seem to suit them. They are not required to make a choice of trade until the fifth week of recruit training. When they make their choice they are asked to list five trades in order of preference and every effort is made to put the man to his trade of first choice.

Special arrangements are made for civilian apprentices whose call-up has been deferred. Most of them are able to enter the highest-skilled trades with little if any trade training in the service. A feature of the Command is the School of Training Organization and Method for instructor tuition.

The successful discharge of the Command's responsibilities depends on the efficiency and devotion of the large number of instructors. The work is not glamorous, but it is vital, and there are many young men in the country today who owe a great debt of gratitude to the instructors who handled them in the early days of their service in the R.A.F.

MAINTENANCE COMMAND

From Air Marshal T. A. Warne-Browne, C.B., C.B.E., D.S.C., Air Officer Commanding-in-Chief

YOU will see Maintenance Command pilots in action in the Royal Air Force Display, but you will not see the Command in action in its normal supply role. It has, nevertheless, played an important part in making the Display possible. Naturally, one thinks of the work of the Royal Air Force in terms of the fighting efficiency of the Operational Commands. My Command is charged with the important task of supplying the machines and equipment that are needed to attain that efficiency. It is our duty to receive from industry the material requirements of the Royal Air Force and to distribute these to all units or formations, whether at home or overseas.

Maintenance Command is proud of its task. By comparison with that of other Commands our work is not glamorous, but it may not be realized that we do a great deal of flying. We are responsible for the collection and delivery of aircraft and for the vital job of flight testing after repair or refit.

Our badge is the raven and our motto is "Service." These symbolize our duty to supply the Royal Air Force wherever it is at work—for Maintenance Command provides the material lifeblood of our Service.

The Royal Air Force cannot operate unless Maintenance Command fulfils its role of chief supplier. This responsibility is our privilege. We realize that if we fail in our task we may ground all the other Royal Air Force Commands. We are thus inspired to live up to our motto—"Service." This we amplify to mean: "to provide the right thing, at the right place, at the right time and in the right condition." If we do less we are dissatisfied. We are proud of our job and conscious of our responsibility.

T. Warne-Browne

ON Maintenance Command rests the responsibility for the receipt from manufacturers and storage and distribution of all the equipment and stores needed by the R.A.F. The equipment ranges from ordinary domestic articles to complete aircraft and consists of some 700,000 separate items. For example, roughly 6,000 different items are held as spare parts for each Spitfire or similar type of single-engined aircraft.

The division of personnel in the Command is, broadly, half civilian and half airmen. By employing civilians, service manpower is saved and greater continuity is obtained in routine work, with a consequent increase in efficiency.

Although Maintenance Command holds and issues all equipment required by the R.A.F. it should not be thought of as a "super Woolworths." In addition to handling individual articles and spares it stores and issues complete aircraft, vehicles and marine craft, and is responsible for their repair and modification. Aircraft are air-tested and collected from manufacturers and delivered to home units by Maintenance Command pilots.

The necessity for war readiness further complicates the task. It would be comparatively simple to hold all items of one type in one place, but the risk of the loss of "all the eggs in one basket" through sabotage or direct enemy action cannot, of course, be accepted. In the last war dispersal varied between three and seven separate holdings of each individual item. To obtain greater efficiency and economy some closing-up has now been possible; strategical considerations, however, prevent the ideal administrative arrangement of putting everything of one sort under one roof.

The Command is at present organized in four Groups, the roles of which are described briefly below.

No. 40 Group is the main equipment-holding formation and controls large depots for the receipt, storage and issue of all equipment and stores excluding complete aircraft, explosives, compressed gases, rations (foodstuffs), petrol, oil, and lubricants. Items have to be suitably preserved and packed to ensure that they are serviceable when they reach their destination. Packaging varies from simple preservation by oil to elaborate humidity-control packs for delicate and fragile items. For repacking and for treatment of equipment not packed on receipt, each large depot has an equipment-preservation plant and packaging section.

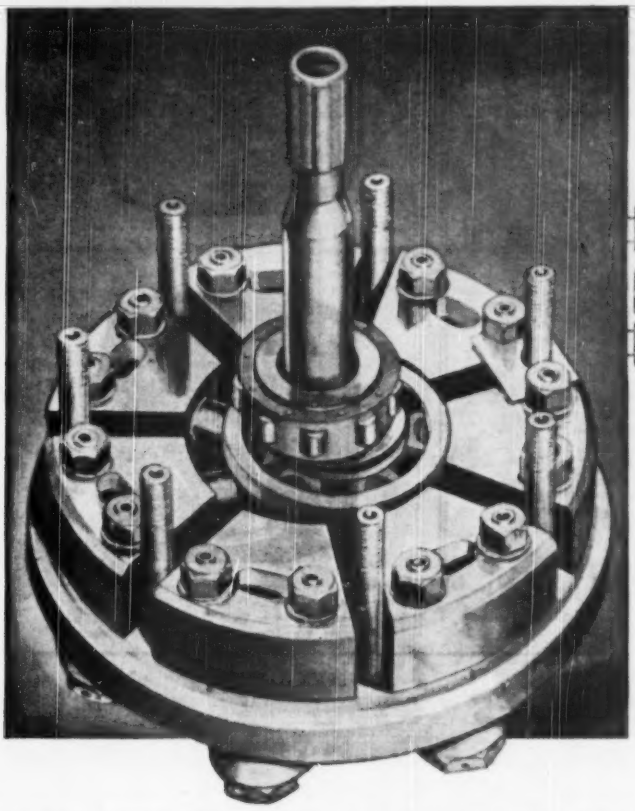
A saving in the labour required for handling equipment in store has been made by introducing mechanical methods, e.g., pallets and fork-lift trucks. These enable equipment to be stored in easily handled quantities on wood or metal platforms. Apart from reducing the time taken to load, move and stack equipment, these methods economize storage area as stores can be stacked to a greater height than was possible by use of the old methods.

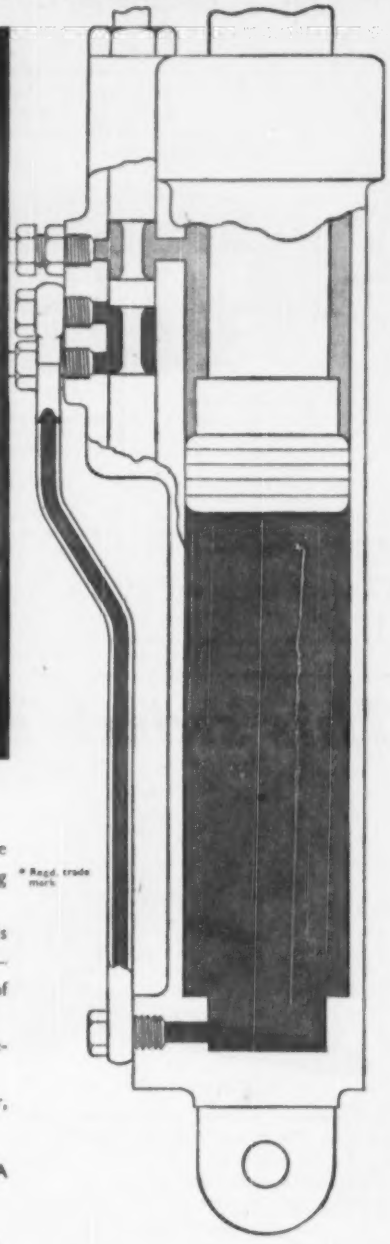
The units of No. 40 Group maintain the records of stocks, receipts and issues and forward to the Air Ministry the data required to determine the orders to be given to manufacturers. It is also the responsibility of No. 40 Group to plan where different stocks should be held, the type of storage required and the storage space which each item will need. Planning for reception of new stocks has to be linked with the disposal of obsolete stocks; this is one of the most complicated aspects of provisioning.

No. 41 Group receives and stores complete aircraft and maintains and modifies them (in conformity with progressive modifications to the particular type) while they are in storage—a job entailing a number of intricate operations.

No. 42 Group is responsible for the sometimes dangerous task of receiving, storing and issuing all explosives stores to the R.A.F. and for performing similar functions in respect of compressed gases, e.g., oxygen, nitrogen and acetylene. It

HYDRAULIC AIRCRAFT EQUIPMENT





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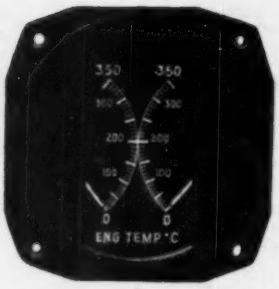

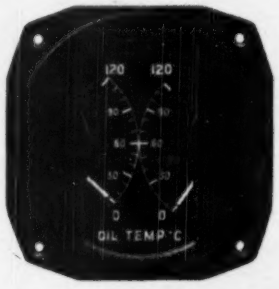

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Above : Model 5128. Dual Engine Temperature Indicator, comprising two Millivoltmeters of 100° scale housed in large-size S.A.E. case. For use in conjunction with copper/constantan, iron/constantan or chromel alumel thermocouples.
Below : Model 5127. Dual Ratiometer Indicator, comprising two 100° Ratiometer movements housed in large-size S.A.E. case. For use in conjunction with thermometer bulbs, electrical oil pressure transmitters, electrical position indicators or any combination of two of these to indicate a variety of temperatures, pressures or positions.

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is also responsible for supervising the distribution of aviation gasoline and lubricating oils, which is carried out under contract. In addition, the Group has, at present, the task of disposing of wartime explosives.

The storage of explosives presents many complications in a small and densely populated country such as Britain. They also require careful periodic inspection to ensure safety and serviceability.

The disposal of stocks which are no longer required is a formidable task, and one which must take full account of both safety and economy. Whenever possible, items are sent to factories for breaking down and the recovery of their constituent materials. Sometimes this is impossible and the explosives have to be dumped in the sea by the R.A.F. (in co-operation with the Army), a process not without its own particular hazards. There is only one suitable dumping ground, which is at a remote point off the Scottish coast. When all other methods of disposal are unsuitable it is necessary to resort to demolition.

No. 43 Group is responsible for aircraft major repair to the extent necessary for the training of Service personnel, and for the repair and salvage of crashed aircraft. In addition, it controls general engineering facilities and is also responsible for the storage and issue of R.A.F. marine craft. The Repair and Salvage Units are highly mobile. The salvage of a modern aircraft which has crashed is a skilled business requiring special equipment which it would be uneconomical to keep at every airfield. The R.S.U.s are therefore allocated to areas of the British Isles. The nearest unit is called in to repair an aircraft where it has crashed or to pick up the remains and take them back to a repair depot or to a contractor where the useful parts are salvaged or the complete aircraft is repaired.

General engineering work is constantly arising which is beyond the capacity of the plant or facilities available at the operational stations. Work on the individual tasks, however, is often not large enough to justify a contract to the aircraft industry. No. 43 Group's engineering depots do this work.

The units of Maintenance Command are distributed all over the British Isles, often in remote and inaccessible places. This complicates the work and the administration of the Command. Now that the first stocktaking of equipment left over from the end of the war—an enormous task—has been completed, many of the uneconomical smaller units are being closed down; but before this can be done stores have either to be sold or removed to permanent depots. The future trend, therefore, is likely to be a steady retraction, at the same time maintaining a complete organization that is ready for immediate expansion in war.

RESERVE COMMAND

From Air Marshal Sir Robert M. Foster, K.C.B., C.B.E., D.F.C., Air Officer Commanding-in-Chief

R. M. Foster.

THE word "Reserve" does not imply great operational activity, yet in my Command it represents those personnel elements without which our existence in another war would become impracticable. The Royal Air Force Reserves, for whom I am responsible, represent every branch and trade of the Royal Air Force; and the majority, volunteering as they do of their own free will, are required to carry out their training during their precious leisure hours, often at very considerable inconvenience to themselves.

Reserve Command is organized into regional groups, of which there are seven, spaced throughout the United Kingdom and Northern Ireland. Their task is to command and develop our very considerable number of Reserve and Auxiliary units whose activities are devoted to giving the fullest possible programme of refresher and continuation training to our volunteers. There are also the Reserve Centres, which provide depot facilities for the Volunteer Reserve, and also care for the ex-Regular and ex-National Service officers and airmen, all of whom have compulsory obligations on release to civilian life.

The role of all these Auxiliary and Reserve personnel, whose number is steadily rising towards the not inconsiderable total which represents our minimum requirements, is to support and strengthen our regular forces, both air and ground staff, throughout the whole range of Royal Air Force activities. Behind all these are the tens of thousands of young enthusiasts in our Air Training Corps, all of whom are training on a volunteer basis to fit themselves for their Service obligations when they grow up. I am glad to say that an increasing number of A.T.C. cadets are coming into the regular forces; and there is no doubt that the present-day training afforded by the A.T.C. is of great value both for Regular and National Service entrants into the R.A.F.

An important task which also falls to my Command is direct recruiting for the R.A.F. and W.R.A.F.; this is uphill work, for reasons which are universally understood.

The chief responsibilities of my Command are, therefore, to raise, maintain and train our Reserve, Auxiliary, and Pre-Entry Forces and to recruit for the R.A.F. and W.R.A.F. Present-day air operations are highly complicated; thorough training is required and the equipment used is varied and intricate. To be efficient, therefore, these volunteers have to set aside the greater proportion of their leisure time for their Service duties. We, in Reserve Command, who are in daily touch with these activities, do appreciate the remarkable effort put out by these volunteers, and would like to see them more widely recognized.

RESERVE Command is the only R.A.F. Command in the United Kingdom organized on a geographical basis. It is responsible for the administration for a number of units which are directly under Air Ministry control or which arenot specifically part of R.A.F. functional commands. It directs all recruiting for the R.A.F. and its Reserves and is in functional control of the reserve and pre-entry forces of the R.A.F. and of those sections of the R.Aux.A.F. which are not in Fighter Command. Operation is through Reserve Groups whose areas correspond with those of the Army Commands and civil defence areas. The main tasks of the Command are to act as a "housekeeping organization" to the R.A.F. at home; to raise and train units of the R.Aux.A.F. up to the stage where they are ready to be transferred to the appropriate operational Command; and to raise and train the large number of reservists required to reinforce and expand the front line on mobilization.

At the outbreak of war, war establishments have to be filled quickly, and the needs for the expansion of the R.A.F. as a whole have to be met. Ample reserves of trained men and women are therefore essential. These needs will be partly covered by National Service men, and those ex-regular officers and airmen who have a Reserve liability on release to civilian life. During their period of Reserve liability the majority of these Reservists carry out spare-time training, both to refresh their skills and to enable them to receive instruction on new equipment and in new techniques. The amount of training required varies. Emphasis is laid on flying personnel and those in technical trades with no civilian counterpart.

With regard to National Service men, in particular, their Reserve liability has been set by Act of Parliament at a maximum of sixty days, to be spread over four years, with not more than twenty-one days in any one year.

The Royal Auxiliary Air Force consists of squadrons and units which form part of the front line of the R.A.F., and they are trained to front-line standard. These units are organized and operate on a part-time basis in peace-time and come into full operation as soon as an emergency arises. They are raised

and maintained on a county or city basis by the Territorial and Auxiliary Forces Associations in the same way as are units of the Territorial Army, but they *are under the command* of the A.O.C.s the appropriate Reserve or Fighter Groups.

An R.Aux.A.F. unit is normally commanded by an Auxiliary officer, and is manned mainly by Auxiliaries, supported by a cadre of regular officers and airmen (and in some cases regular airwomen) who act as instructors and undertake certain administrative and other duties. Women Auxiliaries play an important part in the Fighter Control and Reporting Units.

Existing R.Aux.A.F. units are made up as follows:—

(a) There are twenty Flying Squadrons equipped with fighter aircraft; these are now part of Fighter Command. There are Air Traffic Control Sections attached to most squadrons, and these are designed to give personnel training in the control of the immediate movement of fighters in and around airfields.

(b) There are twenty-six Fighter Control Units, the purpose of which is to train all grades of personnel required to man the air defence organization of the U.K. They provide skilled Auxiliary units which will eventually employ a total of between twenty and thirty thousand men and women on duties ranging from that of officers controlling the operations of fighters, to radar mechanics, radar operators, teleprinter operators and fighter plotters, etc.

(c) There are twelve Light Anti-Aircraft Squadrons of the R.Aux.A.F. Regiment.

(d) There are five Air Observation Post Squadron Headquarters controlling 20 operational Flights. These Squadron Headquarters and Flights are located on R.A.F. airfields throughout the U.K. and serve the Territorial Army. The pilots for the Operational Flights are drawn from Territorial Army Officers of the Royal Artillery, but aircraft maintenance is undertaken by R.Aux.A.F. personnel.

The Royal Air Force Volunteer Reserve.—Whilst National Service men provide a valuable reserve, they cannot meet the whole requirements, particularly in the highly skilled trades, on account of the comparative short period of regular service which they have undertaken, and considerable volunteer efforts are also needed. Members of the R.A.F.V.R. are, in the main, trained officers, airmen and airwomen, who have had considerable previous Service experience. They are supported by qualified personnel without previous service, but highly skilled in a civilian trade of value to the R.A.F.

Training in the R.A.F.V.R. and the W.R.A.F.V.R. is primarily designed to maintain the efficiency of aircrew and tradesmen up to the standard they attained on full-time service.

Flying training is given at some twenty Reserve Flying Schools, and ground training at some twenty-two Reserve Centres, dotted throughout the country. In addition, R.A.F.V.R. personnel carry out fifteen days' training annually, at Reserve Flying Schools for flying personnel, and at regular R.A.F. flying stations for ground tradesmen.

The essential difference between the R.A.F.V.R. and the R.Aux.A.F. is that, whereas the latter is organized in units which can be individually employed in fighting organizations in war, the Reserve personnel will be allocated individually to duties in any unit which requires bringing up to wartime strength, or is created under the general expansion.

The University Air Squadrons.—The purpose of the University Squadrons is to provide training during their university careers for men who wish to prepare themselves for commissioned service in the regular or Auxiliary and Reserve forces, and are prepared to give time to this training. Altogether, there are now fourteen University Air Squadrons operating.

The Air Training Corps.—The aims of the Air Training Corps are to foster in youth a sense of national pride, good citizenship and self-discipline; to encourage a practical interest in aviation by careful training, so as to prepare these cadets interested in joining the R.A.F. or one of its Auxiliary or Reserve forces; and to give others experience which will be valuable to them during their period of National Service.

The present strength of the Corps is about 40,000 cadets. Those who obtain the Proficiency Certificate have special opportunities for entry into the R.A.F., including entry as officers through the R.A.F. College, Cranwell, and entry by way of the aircraft apprenticeship training schemes. Proficient cadets who pass the requisite tests may also be given aircrew training during their period of National Service.

A new scheme has recently been introduced for up to 200 annual flying scholarships to be granted to specially selected proficient cadets, whereby they can obtain flying training up to Private Pilot's Licence standard. This scheme will afford an opportunity for young men to learn to fly who otherwise would be denied the privilege.

The Corps is organized in Wings, usually on a county basis, within existing Reserve Groups, and consists of varying numbers of A.T.C. Squadrons formed in some instances by schools but mainly by local committees. In many public schools the Combined Cadet Force is in operation, which is organized in separate sections for each of the three Services. For all purposes of training the A.T.C. and the R.A.F. sections of the Combined Cadet Force are treated alike.

WOMEN'S ROYAL AIR FORCE

From Air Commandant N. M. Salmon, O.B.E., Director, Women's Royal Air Force

Nancy M Salmon

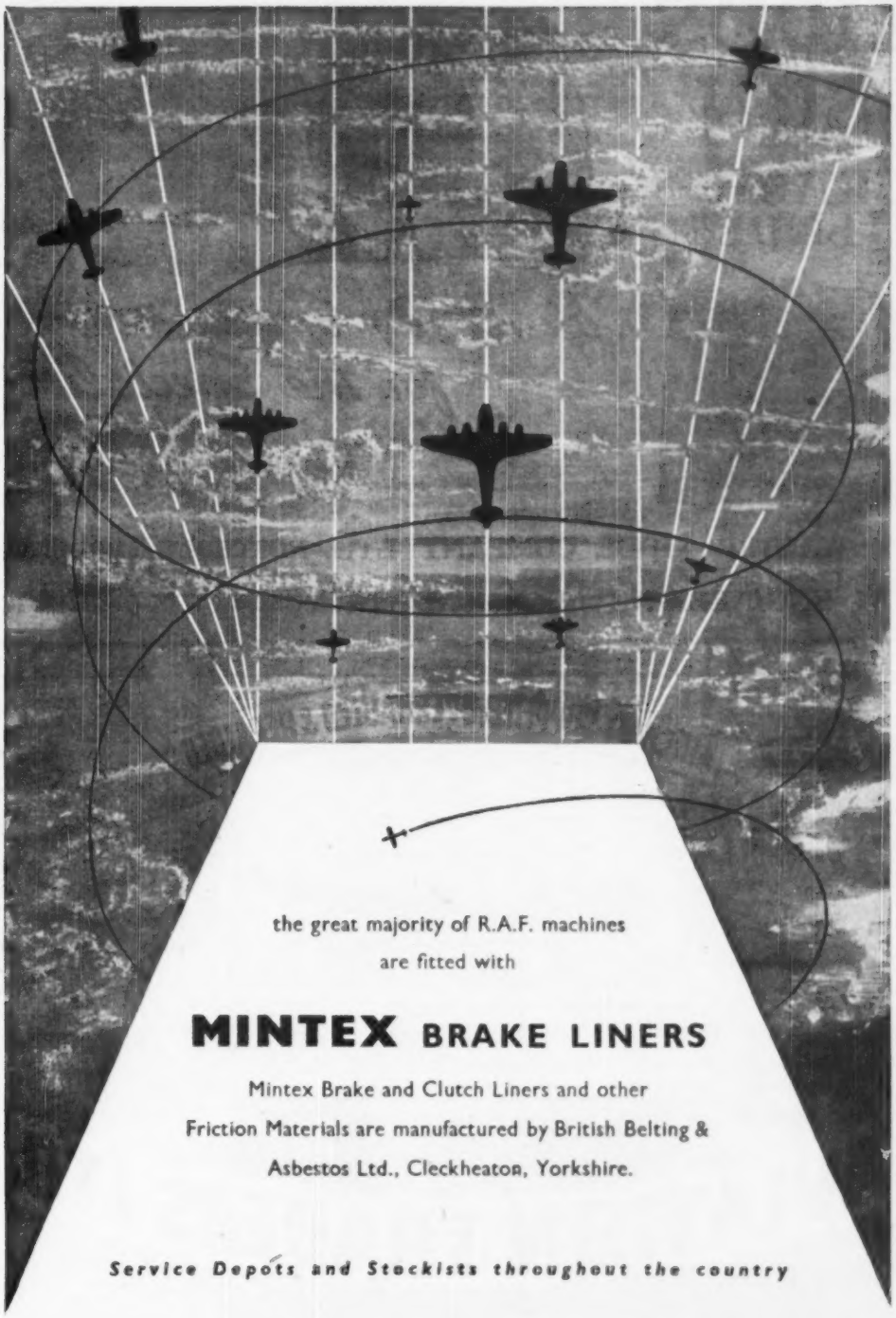
THE Women's Royal Air Force is as yet young in history. As a part of the regular Royal Air Force it is but one and a half years old; nevertheless, the courage and devotion to duty displayed by its predecessors (the W.R.A.F. of 1918-1920 and the W.A.A.F. of 1939-1949) are sure and indisputable signs that the women of to-day, who are ready and willing to serve their King and Country as regular members of the Royal Air Force, will do so to their utmost in one great team with the men whose tasks they share.

The women of the Royal Air Force are indeed proud to know that they are now constituted as an integral part of that Force and that they are entrusted with the same degrees of responsibility and skill as their male counterparts. They will, I know, play their appointed part with courage and determination, keeping alive the spirit of the Royal Air Force, and sharing fully in the task of maintaining a strong and efficient Service—and thus, in a wider sphere, make their own contribution towards the preservation of world peace.

THE Women's Royal Air Force was first formed on April 1st, 1918, when the R.A.F. was constituted as a separate service. Over 500 officers and nearly 32,000 airwomen served before the force was disbanded in 1920. In 1938 the need was realized for a force of women to replace men in a limited number of trades against an emergency. In that year, the Auxiliary Territorial Service was formed, and a number of whose companies were earmarked for service with the R.A.F. Differences in the individual needs of the Army and R.A.F. made it necessary for a separate force to be formed and the Women's Auxiliary Air Force came into being in June, 1939.

By the time the war broke out the strength of the force was approximately 2,000, with a sprinkling of administrative officers, and the trades were limited to six. From that small nucleus, the W.A.A.F. expanded to a strength of 30,000 in 1941, when members of the Force became officially members of the armed forces of the Crown and officers were authorized to hold His Majesty's Commission. The W.A.A.F. reached its peak strength of 182,000 (including 5,800 officers) in 1943. Airwomen at that time were serving in 83 different trades, including the most highly skilled. They proved that they could do the job under exacting war-time conditions and made valuable contributions to the operational success of the R.A.F. Many officers and airwomen were decorated for gallantry.

From experience gained in two world wars, it was realized that, in order to build up quickly and efficiently a women's element of the Service in times of national emergency, its administrative structure should not be allowed to disappear



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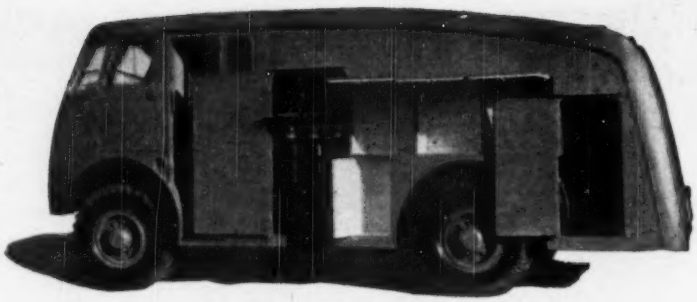

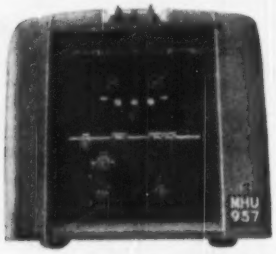

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in times of peace. In May, 1946, therefore, the Government announced that the Women's Forces would be continued on a voluntary basis as a permanent feature of the armed forces.

During the war the women's Service, starting as a completely separate entity with its own rules and regulations, gradually became integrated with the R.A.F. This policy has now been carried to its logical conclusion; since February, 1949, women have been commissioned and enlisted in the R.A.F. under substantially the same terms as the men.

The policy of the R.A.F. is to employ women in substitution for men not merely because there is a manpower shortage, but to provide a career in which women will work side by side with men in a wide variety of duties and trades. There is, however, no intention of departing from the principle that women's special interests should be safeguarded by women, and the R.A.F. rules and regulations have been modified in some cases to meet the specific needs of women. For instance, women who marry whilst serving may either continue to serve or may leave the Service by giving 28 days' notice at any time within three months after the date of marriage.

Over 60 R.A.F. trades have been opened to women, who are trained side by side with men and must attain the same standard of trade skill and knowledge. On R.A.F. stations at home and overseas, they are employed on the same jobs as the men. During the Berlin Air Lift a W.R.A.F. corporal was in charge of a gang of men fitters working on the repair and servicing of aircraft engines. Her success is apparent from the fact that she was awarded the B.E.M. for her work.

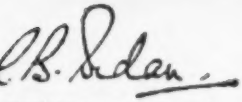
Since the end of the war the women have been concentrated on fewer stations owing to their comparatively small numbers, as this makes for greater ease of administration and economy in women officers. Airwomen are usually accommodated in brick-built barrack blocks and take their meals in the main mess with the airmen. W.R.A.F. corporals now become members of the corporals' clubs and W.R.A.F. sergeants of the sergeants' messes. The R.A.F. education scheme is open to women as are classes in dressmaking and domestic science.

Airwomen serve overseas in Germany, the Middle East (including the Suez Canal Zone), Aden, Habbaniya, and Singapore, but no girl is posted abroad before her nineteenth birthday or before she has been in the Service for six months.

The normal commissioning policy is to select a large percentage of officers from among serving airwomen for commissions in the Equipment, Secretarial, Provost, Physical Fitness, Education, Fighter Control and Catering Branches. There are, however, two schemes whereby women with the necessary qualifications are able to join the W.R.A.F. either directly in commissioned rank or with a view to training for commissioned rank. Under Scheme 1, women with professional qualifications may be selected for direct appointment to short-service commissions in the Technical, Medical, Dental, Equipment, Secretarial, Catering and Educational Branches. Under Scheme 2, candidates must have been educated at least to the school certificate standard and enlist in the W.R.A.F. on a normal four years' engagement, but after recruit training they are posted as cadets for professional training and then to an O.C.T.U. Successful candidates are then commissioned either in the Secretarial or Equipment Branch.

ROYAL OBSERVER CORPS

From Air Commodore R. B. Jordan, C.B., D.F.C., A.D.C., Commandant, Royal Observer Corps



THIS year the Royal Observer Corps has celebrated its silver jubilee after 25 years of service in the air-defence organization of these islands. I wonder how much the British public knows of the history of this Corps, which won the title "Royal" for the part it played in the Battle of Britain? How many realize that hundreds of its members were on board the ships that on D-day sailed across to Normandy? These members of the R.O.C., the experts in aircraft recognition, were also employed on British and American defensively equipped merchant vessels to help the sailors to discriminate between friend and foe in the air. These are only two examples from the war history of this Corps, but I think they show the part it played in World War II.

Now, to-day, despite radar, the Royal Observer Corps is still an essential part of our air-defence system and as such comes under the direct control of the Commander-in-Chief, Fighter Command. The Corps—which covers the whole of England, Scotland and Wales—is organized in five Areas, which are in turn divided up into 39 Groups. The personnel are citizens from every profession and walk of life who unite under the Royal Observer Corps ensign into a well-trained team which functions smoothly and efficiently. Our job is a team job and we are dependent on every individual pulling his or her weight and fitting himself or herself into the particular job allotted. The Corps is divided into two main branches—posts and operations rooms. The duty of the posts is to report aircraft, their height, direction of flight and position, to the operations room: the operations room puts this information on a plotting table and it is then available for Fighter Command.

The Royal Observer Corps, like all voluntary institutions, needs recruits, but it needs only those who are really keen to serve in the air defence of our country and who are prepared to see the job through. We in the Corps still prefer quality to quantity.

THE Royal Observer Corps, in peace-time, is a uniformed Corps of part-time volunteer officers and observers—both men and women—controlled by a nucleus of whole-time officers.

The primary function of the R.O.C. is to provide the air defence organization with information as to the type and movements of both hostile and friendly aircraft flying over Great Britain. Their secondary function is to act as a reporting organization, in all aspects of the air situation—the dropping of parachutes, fall of bombs and location of crashed aircraft are examples of the kind of information dealt with. In peace-time the Corps is concerned with practice and training as a vital component of air defence, and it becomes fully operational only during evening and week-end exercises.

Both operationally and administratively the Royal Observer Corps is under the direct control of the C.-in-C. Fighter Command. Such control is exercized through the Commandant of the Corps, who is a serving air commodore of the R.A.F.

Having a status approximating to that of a Group under Fighter Command, the Corps' Headquarters is situated adjacent to H.Q., Fighter Command, and, under the direction of the Commandant, R.O.C. officers control the various branches—operations, signals, equipment, etc. Administrative duties are discharged by Civil Servants.

Below the Corps' H.Q. the country is divided into five areas, each under the control of an Area Commandant and Area Staff Officers. The Area H.Q.s are located adjacent to the corresponding level within Fighter Command. Within each Area are a number of R.O.C. Groups (a total of thirty-nine throughout England, Scotland and Wales) under the control of a Group Commandant, who is directly responsible to the appropriate Area Commandant. Each Group is an operational unit composed of upwards of 48 posts, linked by a telephone network, and reporting to an operations room where the information is co-ordinated and sifted before being passed to the R.A.F.

The R.O.C. posts, where the actual spotting and reporting takes place, are deployed throughout the country at intervals of eight to ten miles. Each site is chosen to give the most complete coverage of the surrounding countryside.

Apart from the highly skilled job of aircraft recognition, post procedure is relatively simple. It is this very simplicity that accounts for the particular value of the work. Aircraft are reported visually in relation to their ground position, height, direction of flight, and the number and type being given. In the case of aircraft which are plotted by sound, the track is determined by intersecting bearings given from a number of different posts.

Procedure within the operations room is more complicated.

Briefly, it consists in plotting the post reports on a large, gridded map by the use of counters which have a particular significance. This track information is integrated with similar information which is being handed in from adjacent Groups and displayed on a "long range board," in order that adequate warning may be given of incoming tracks. Liaison facilities are provided by telephone links to adjacent Groups, and to the operations rooms of the R.A.F. By skilful co-ordination of all the information produced from the various sources a complete "air picture" is continuously maintained, in readiness to "tell forward" required tracks to the air-defence organization.

The strength of the R.O.C. system lies in the fact that the tracking is done by human observation and hearing and, apart from a telephone network, there are no mechanical aids needing maintenance. The system is simple and almost foolproof. The limiting factors are the range of human vision and hearing; therefore, in these days of high-altitude flying, it is necessary for radar and the R.O.C. to act as complementary systems if complete coverage of all aerial activity is to be obtained.

R.A.F. REGIMENT

From Air Vice-Marshal H. T. Lydford,

C.B., C.B.E. A.F.C., Commandant-General R.A.F. Regiment

IT gives me great pleasure to send a message through the medium of *Flight* to all those who are interested in the work and responsibilities of the R.A.F. Regiment.

Lessons of the 1939-1945 war taught us that the Royal Air Force must be capable of protecting its own airfields and installations. These lessons—exemplified by our early reverses in Europe, in Greece and in Crete—led to the formation of the R.A.F. Regiment in February, 1942. In a future war, therefore, the Royal Air Force, in addition to fighting in the air, will fight on the ground.

Fighting on the ground involves responsibilities in the protection of our airfields and installations from infiltration by the enemy both from the ground and from airborne attack. In addition, there is the need for station defence against enemy low-flying attacks. Moreover, we must look to the future and be ready to defend ourselves against atomic, biological and chemical warfare. All this demands training and organization in peace to enable *all* personnel in the Royal Air Force to be efficient in these additional duties which will be required of them in war.

In conclusion, there is no doubt that the high morale and *esprit de corps* of R.A.F. Regiment officers and airmen which was so evident in the last war have since been strengthened and fortified by consciousness of their important tasks.

H.T. Lydford.

ONE of the important lessons of the Second World War was that, to maintain full potential effort, air forces must be able to operate from airfields and other bases which are vulnerable not only to air attack but to attack by infiltrating enemy land forces and partisans. The Royal Air Force, traditionally flexible, rapidly adjusts itself to changing conditions; and of the measures adopted to meet these threats, the formation of the R.A.F. Regiment is most widely known.

The Regiment is not, however, a force established to defend on the ground an otherwise defenceless air force. The R.A.F. as a whole is essentially a combatant service, on the ground as in the air, and is trained accordingly. Broadly, the role of the Regiment is to provide full-time ground fighting units to enhance the effectiveness of defence measures at the more vulnerable installations, and to form a field from which can be selected staff and instructors to aid and advise the R.A.F. in ground defence training and ground operations.

Operational units of the Regular R.A.F. Regiment include rifle (infantry), light anti-aircraft, and armoured car squadrons. Normally, two or more squadrons, acting together, are controlled by Regiment wing headquarters. A Regiment wing may consist of squadrons all of one type, or a combination of any or all types, and the composition may be changed from time to time in the interests of flexibility and economy of force.

Closely associated with the R.A.F. Regiment, and established for similar operational tasks, are forces locally raised in Iraq, Aden and Malaya. Officers and N.C.O.s drawn from the Regiment serve with these forces and gain much valuable experience of field service conditions, even in peace time.

A proportion of Regiment officers and N.C.O.s are employed at R.A.F. Colleges and Schools, and with Commands, to instruct R.A.F. personnel in ground defence. Officers of the Regiment are included in the staff at the Air Ministry, and at headquarters of Commands and other formations.

The Regiment is also represented in the R.Aux.A.F., operational squadrons having been formed in the United Kingdom, which provide a valuable contribution to the forces available for active service in war. These units are commanded and manned by part-time volunteers, many of who served with the the Regiment in war time—and have a small nucleus of regular personnel for administrative and instructional duties. Enthusiasts who are unable to join the established squadrons of the R.Aux.A.F. Regiment may apply for the Regiment section of the R.A.F.V.R.

Although the R.A.F. Regiment was not formed until 1942, it served in every theatre of war in which the R.A.F. was subsequently engaged. Squadrons of the Regiment fought in the Middle East, North Africa, Italy, France, Germany, and South East Asia—and their value was emphasized in the despatches of more than one Commander-in-Chief. The *esprit-de-corps* born in those days has been maintained and strengthened in the post-war years. "The Regiment" is proud to be an integral part of the R.A.F.—and its aim is to be worthy of its Air Commodore in Chief, H.M. The King.

INDEPENDENT ESTABLISHMENTS

THE briefest inspection of this special R.A.F. Number of *Flight* reveals how complex is the structure of the modern air force, with its inevitable tendency towards specialization. Some of the R.A.F.'s specialized units devoted to training or research have already been mentioned; a word must also be said about a number of other special formations.

No. 90 Group, for example, which is directly controlled by the Air Ministry, is devoted mainly to signals and radar work. It administers the Central Signals Establishment, whose Lincoln *Iris* has visited R.A.F. signals units the world over.

Technical Training Command administers the recently formed *R.A.F. Technical College*, which has three divisions. Of these, engineering is dealt with at Henlow, armament officers are trained at Lindholme, and the signals division uses the facilities of the former Empire Radio School at Debden.

Senior officers of all three Services undergo advanced training at the *School of Land/Air Warfare*, Old Sarum, which comes under the jurisdiction of Fighter Command.

To fit selected officers for command or staff appointments and, later, for senior posts, the Air Ministry maintains two *Staff Colleges*—at Andover and Bracknell.

In addition to more routine responsibilities, the Directorate-General of Medical Services has charge of two important establishments: *The Institute of Aviation Medicine* at Farnborough, and *The Institute of Pathology and Tropical Medicine* at Halton.

In centres of aeronautical research maintained by the Ministry of Supply, the R.A.F. is well represented. Aircrews and technical staff are provided for *The Royal Aircraft Establishment*, Farnborough; *The Aeroplane and Armament Experimental Establishment*, Boscombe Down; *Marine Aircraft Experimental Establishment*, Felixstowe; and *Airborne Forces Experimental Establishment*, Beaulieu. The three last-named centres are commanded and administered by the R.A.F. Also administered by the R.A.F. for the Ministry of Supply is the *Empire Test Pilots' School* at Farnborough, which provides courses for Commonwealth and foreign pilots, as well as for the R.A.F. and Navy.

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THE R.A.F. BENEVOLENT FUND

How the Royal Air Force Display Will Help Needy Airmen and Their Dependants

By Air Vice-Marshal SIR JOHN W CORDINGLEY

A.V-M. Sir John W. Cordingley, K.C.B. C.B.E., R.A.F. (Ret.), is controller of the R.A.F. Benevolent Fund. On this page he explains its aims and organization.

PROFITS from this week's Royal Air Force Display are being devoted to the R.A.F. Benevolent Fund, which exists to relieve distress among serving and ex-Service members of the R.A.F. and W.R.A.F. and their dependants.

Some of those who go to Farnborough may wonder why the Fund needs to raise money almost five years after the end of the war. I think I can best answer this question by setting down a few facts and figures.

The most important fact is that the Fund is today doing more than ever before in its thirty-one years' existence to help serving and ex-Service members of the R.A.F. and W.R.A.F. and their dependants in distress.

In 1949, more than £711,000 was spent on all forms of assistance. That figure was the highest yet, but expenditure is still rising, though I regret to add that revenue is falling. The increasing cost of living, continued housing problems and the fact that children of the war years are now reaching school age in growing numbers are three major reasons for mounting expenditure.

The work of the R.A.F. Benevolent Fund is extremely varied and interesting. Helping, as the Fund does, about 600 cases every week, the staff see a wide cross-section of life. The aim is to relieve distress. Types of assistance given include financial aid not provided by the National Health Scheme, in time of sickness or convalescence; payment of pressing debts; setting disabled men up in business after discharge from the R.A.F.; buying tools and working equipment for ex-Servicemen starting out in civil life; meeting maternity expenses and providing prams, cots and babies' clothing; helping with the expenses of emigration in necessary cases; redemption of pawned articles; and a great volume of educational work. Help may be in the form of a loan, repayable when times are better, or of an outright grant, according to the circumstances disclosed.

Education aid is perhaps one of the Fund's most important activities. The volume is increasing steadily. So far as educational assistance alone is concerned, we expect a peak period will be reached between 1959 and 1966. Last year, the Fund spent £74,006 on such aid, plus £12,590 on the upkeep of the Fund's own two residential schools—Rooks Hill House, near Sevenoaks, and Vanbrugh Castle, Blackheath. This outlay represented an increase of more than £16,000 on the previous year and we anticipate a still further increase in 1950.

The Fund's own schools—the Alexander Duckham Memorial Schools—though only a fractional part of the educational work, are splendid places. Twenty younger children, boys and girls from two to seven, live at Rooks Hill House. Priority is given to those whose fathers were aircrew, killed whilst serving with the R.A.F. Boys from seven onwards attend Vanbrugh Castle, which has accommodation for 50. University scholarships and other higher-educational work are also within the scope of the Fund.

Other branches of the work include visits by honorary representatives to widows and next-of-kin of fatal casualties; these dependants are offered immediate help when it is most needed.

I cannot possibly detail in the space available here all the multifarious activities. May I finally add a few words about those who benefit? Anyone commissioned or enlisted in the R.A.F. or W.R.A.F. in whatever capacity, qualifies for aid when in distress by the very fact of service, whether past or present. Men called up in peace-time since January 1st, 1949, under the National Service Act, will normally be eligible for assistance for a limited period only after completing their service. All others remain eligible for consideration at all times, as do their dependants also.

The various committees of the Fund—finance, general purposes, grants, educational advisory, Memorial Schools—are responsible to the council, whose chairman is Lord Riverdale. Lord Riverdale succeeded the late Duke of Kent in 1942. H.R.H. the Duchess of Kent is the president of the R.A.F. Benevolent Fund, which enjoys the patronage of His Majesty.

There is also an appeals committee, which has its own headquarters at 1, Sloane Street, London, S.W.1 (tel. SLOane 1681).

I should like to conclude this short survey of the Fund's aims and objects by stressing that all donations, however small, will be warmly welcomed at that address. Because expenditure is in excess of income, and likely to continue so, it is essential for the Fund to have increased support if the great task of helping those in need is to continue. The Fund is still aiding men who served in the 1914-18 war and is well aware that it will be impossible to relax the present efforts during the next 25 years or more. The Council is prepared to spend capital in excess of income where necessary, and has done so during the past years, but such a course cannot with safety be pursued indefinitely.

The Fund, which is a friend to so many, itself never needed true friends more than it does now and will do in the future; such friends will ensure that the Fund will not fail those who served so magnificently when the country was in peril and who may themselves be in dire need in their old age—perhaps for the first time.

If those who are to appreciate the skill and daring of the Royal Air Force next Friday or Saturday will send a donation or make a subscription, they will be contributing to the happiness of some deserving airman and his family and dependants.

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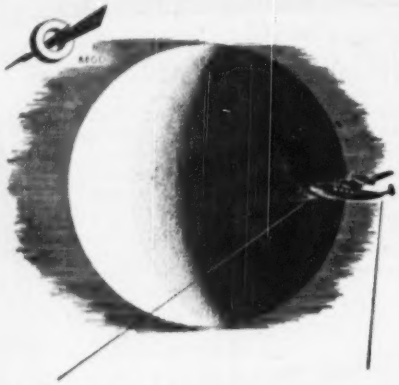

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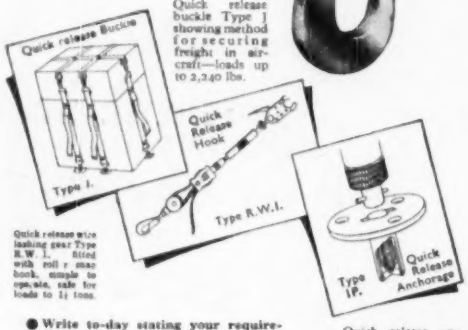

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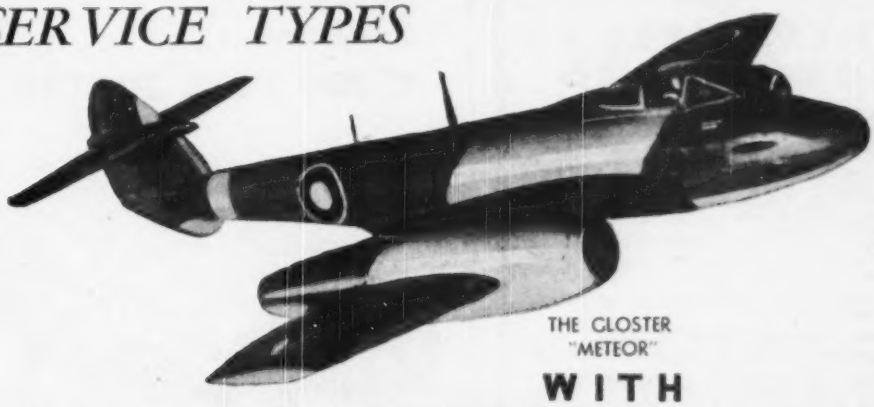

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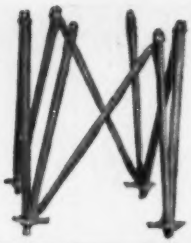

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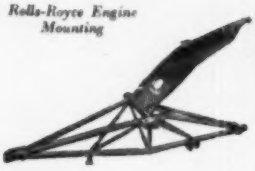

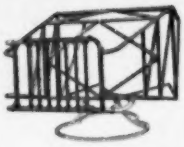

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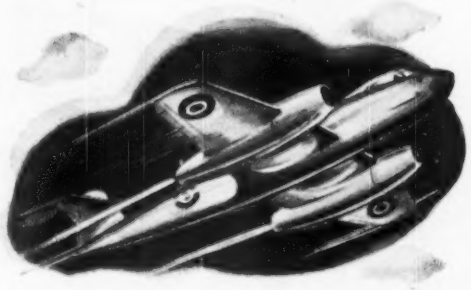

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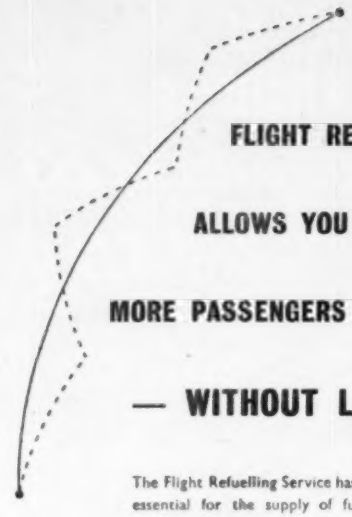

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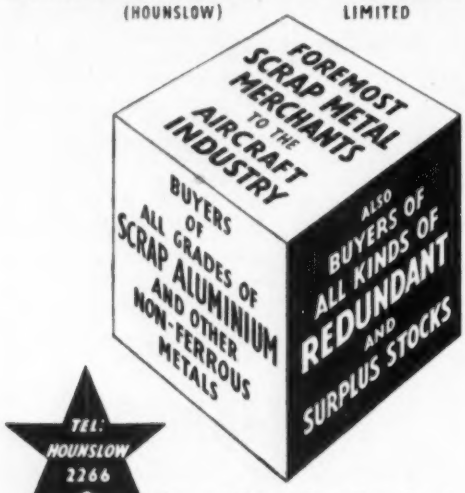
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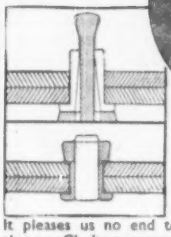

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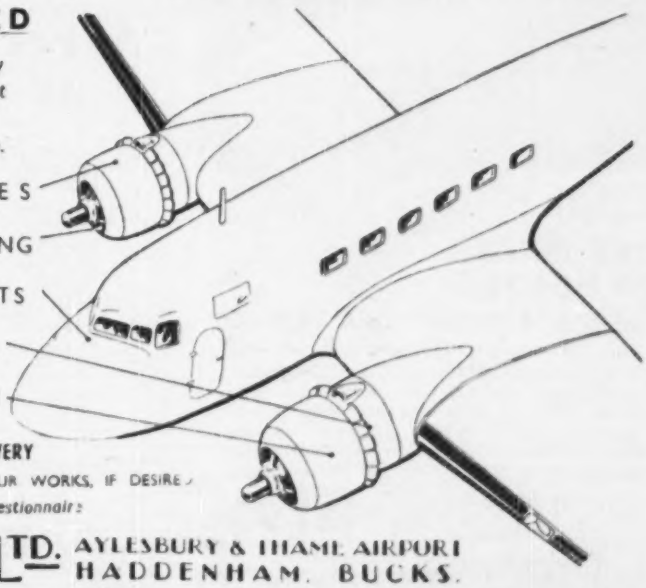

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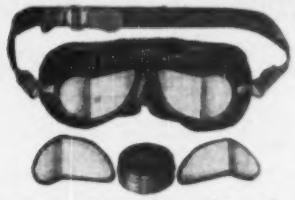

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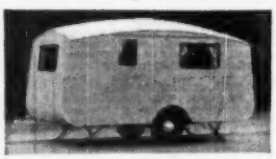

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Two great airline operators, Eastern Air Lines and Trans World Airline, have ordered 65 new 40-passenger Martin 4-0-4 airliners. Each of these pressurized-cabin airplanes will be equipped with two 2400-horsepower Pratt & Whitney Double Wasp engines turning Hamilton Standard reversible Hydromatic propellers.

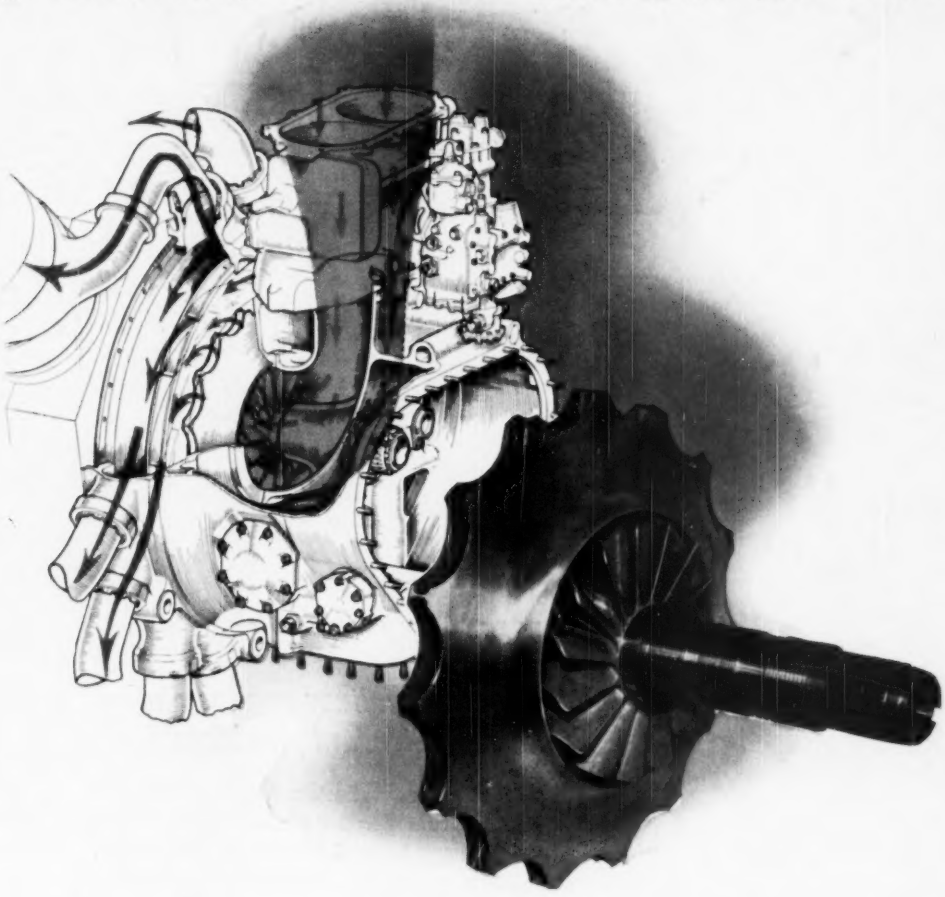
This dependable engine-propeller combination plays a major role in providing excellent flying characteristics and high cruising speed for these aircraft.

European Office:
4 rue Montagne du Parc,
Brussels, Belgium

UNITED AIRCRAFT
Export Corporation
EAST HARTFORD, CONNECTICUT, U. S. A.

PRATT & WHITNEY ENGINES | HAMILTON STANDARD PROPELLERS | CHANCE VOUGHT AIRPLANES | SIKORSKY HELICOPTERS

★ *contributing to "Bristol" sleeve-valve fuel economy*



★ *High efficiency induction system*

"Bristol" sleeve-valve engines employ a high efficiency single stage supercharger. Its advanced aerodynamic design not only reduces the power required to drive it, but also results in a lower induction temperature, which is equivalent to using a fuel of higher octane value.

An even mixture distribution is also of great importance to the efficient running of an engine, particularly at low engine speeds and with modern leaded fuels. The soundness of the "Bristol" combined supercharger and induction system has been demonstrated by tests which have shown that lead separation is avoided, and preheating of the charge is quite unnecessary. There is therefore no restriction on the use of low engine speeds and optimum economy can always be attained.

"Bristol" **low fuel consumption sleeve-valve engines**

THE BRISTOL AEROPLANE COMPANY LIMITED ENGLAND

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